AMERICAN MACHINIST

MARCH 19, 1942

Heald No. 72A

The ALL Purpose Internal Grinding Machine

AS A PLAIN MACHINE the Heald No. 72A is ideal for tool rooms and miscellaneous work.

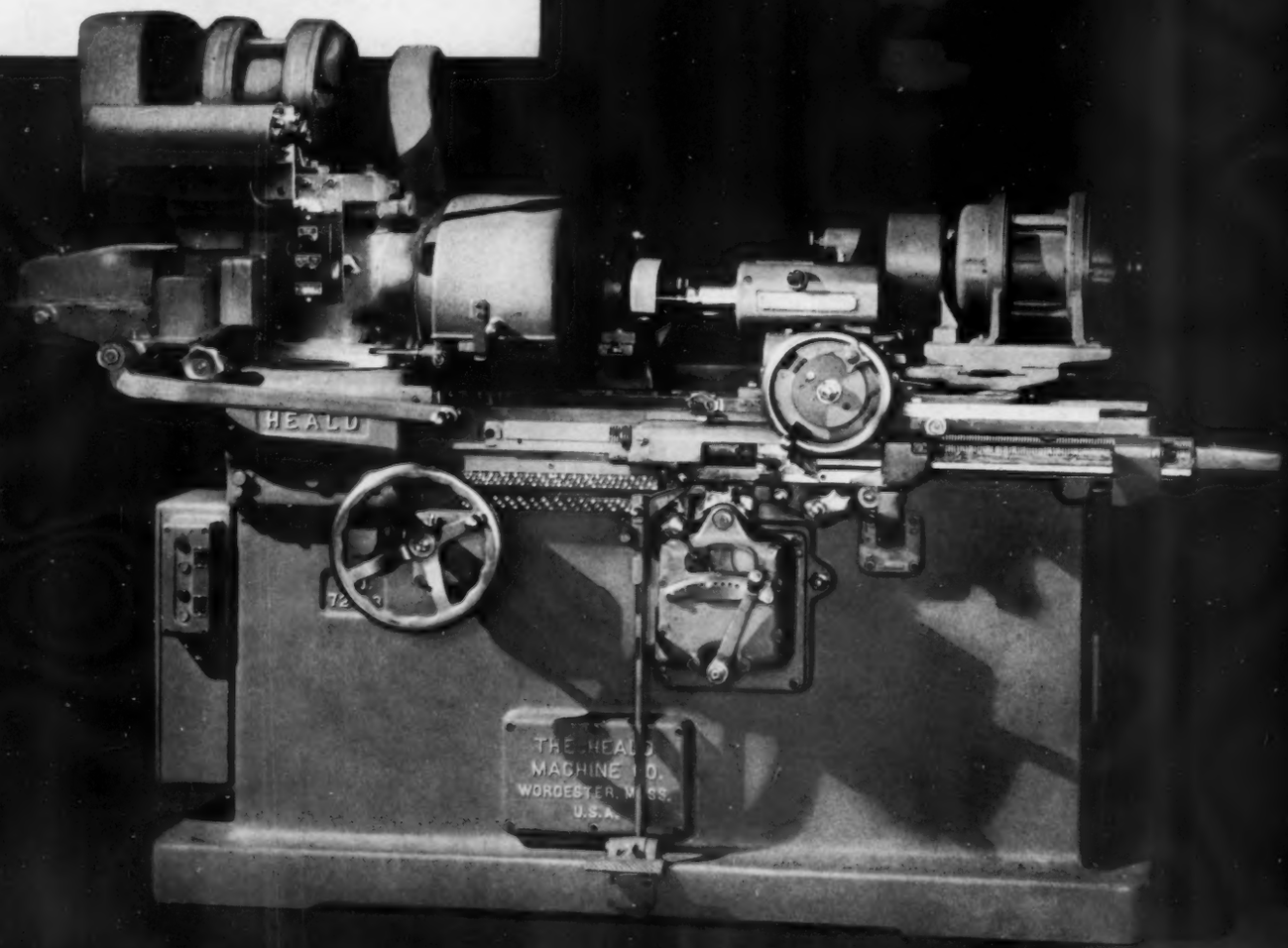
WHEN ARRANGED SIZE-MATICALLY it is excellent for mass production of all kinds of parts where automatic sizing is desirable. Will handle all types of holes straight, taper, blind, interrupted, large or small.

CAN BE FURNISHED GAGE-MATICALLY when there is mass production of straight open holes and solid plug sizing is preferred.

With over 5500 in use the world over the Heald No. 72A IS THE MASTER MACHINE where there is internal grinding.

If you have precision finishing of any kind why not let one of our engineers give you unbiased information on how it can best be handled.

THE HEALD MACHINE COMPANY
WORCESTER, MASS.



AMERICAN MACHINIST

March 19, 1942

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New Hands—With cutters used by hundreds of newcomers to the machine shop, many of them women, tool control needs more attention than ever

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McGraw-Hill Publishing Company, Inc.

Publication office, 99-129 North Broadway, Albany, N. Y. Editorial and executive offices, 330 West 42nd Street, New York, N. Y., Branch offices: Chicago, 520 North Michigan Ave.; San Francisco, 68 Post Street; Aldwych House, Aldwych, London, W.C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta.

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VOLUME 86 NUMBER 6

AMERICAN MACHINIST. Copyright 1942 by McGraw-Hill Publishing Co., Inc. Published every other Thursday, price 35c a copy. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42nd Street, New York, N. Y. Subscription rates — United States, Canada, Mexico and Central and South American countries $5.00 a year, $8.00 for two years, $10.00 for three years. All other countries $8.00 a year, $13.00 for two years, $16.00 for three years. Entered as second class matter, September 29, 1936, at Post Office, Albany, N. Y., under the act of March 3, 1879. Printed in U.S.A. Cable address: "McGrawhill, New York." Member of A.B.P. Member of A.B.C.

A McGRAW-HILL PUBLICATION

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TOOLING TIPS FOR TODAY AND EVERY DAY ★

★ The Annual Tool Engineering Number, published just before the A. S. T. E. Convention, is planned to give you valuable, timely tooling data. The articles can help solve many of your tooling problems and your careful readership of them will pay dividends.

READ AND USE THESE ARTICLES

Cutting Oils — special "blue section," a condensed handbook on the subject. Anyone using cutting tools will find this a valuable reference.

Gage and Cutter Conservation — Armament Section Number 39, 16 pages of detailed information describes control plan of a large Canadian plant using a large number of gages and cutters in holding close tolerances. It may help you in making your supply of these scarce items go further.

Standardizing Carbide-Tool Tips—by Frank Curtis, president of the A. S. T. E. shows how to eliminate many special shapes in favor of more easily obtainable standard carbide-tool tips.

Abrasive Cut-Off Practice — first of three articles. A series of articles that will provide you many handy hints.

Drawing Dies for Rectangular Shells — concise and detailed.

The Role of Tool Engineering in the Victory Program. The job that must be done and the importance of this function in doing it.

Short Cuts for the Small Shop — another in this popular series.

Design of Special Chucks—fifth in the series of sketch presentations showing methods you may be able to use.

Tooling Speeds Jack Production — picture spread shows tooling procedures that aid production. Many of these ideas can be applied to your work.

ANNUAL TOOL ENGINEERING NUMBER

March 19, 1942

TEETH OF BEVEL AND HYPOID GEARS PRECISION GROUND ON THIS

New Gleason

No. 17 HYPOID GRINDER

FOR GENERATED GEARS AND PINIONS

With the new Gleason No. 17 Grinder, the teeth of hardened curved-tooth bevel and hypoid gears and pinions are now finished by precision grinding many times faster than possible by cutting.

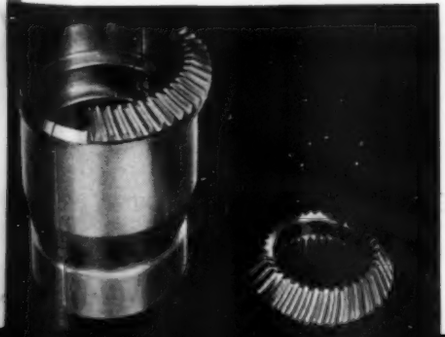
Send prints for complete information on grinding your bevel gears.

ADVANTAGES OF GROUND BEVEL GEARS

Heat-treat distortion corrected . . . all teeth made uniform . . . surface irregularities eliminated . . . tool marks removed . . . tooth profile and fillet blended smoothly into bottom land . . . RESULT—SMOOTHER, QUIETER, LONGER-LIVED GEARS.

SPECIFICATIONS

Cone distance, maximum	12½"
Pitch, coarsest	2½ DP
Whole depth, maximum	¾"
Face width, maximum	2½"
Ratio, shafts at 90	1 to 1—4½ to 1
Wheel diameters	5¾" to 13½"
Feeds, time per pass per tooth	1.9 to 11.8 sec.
Floor space	65¾" x 111¾"



◆Ground Spiral Bevel Gears for Controllable Pitch Propeller Unit.

GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

Weapons for

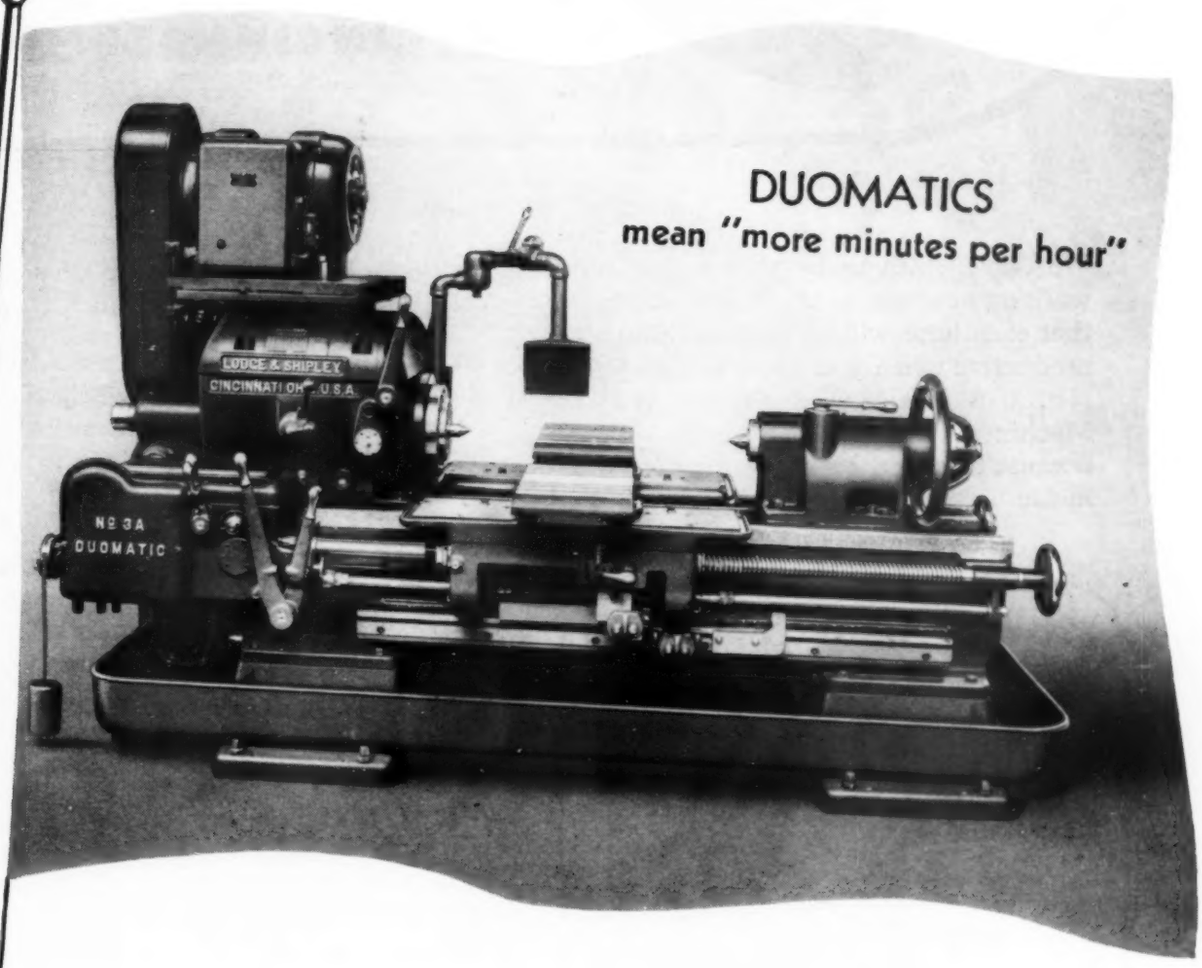
THE hands of the clock are measuring invaluable minutes today! The weapons of war are the tools of Victory for America. We cannot have too many. We cannot have them too fast. On the production lines, Lodge & Shipley Lathes are shaping these tools of Victory accurately and speedily . . . fifty years of development and experience are behind them.

THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A

since 1892

Engine *Tool Room* *Automatic Lathes*

VICTORY



DUOMATICS
mean "more minutes per hour"

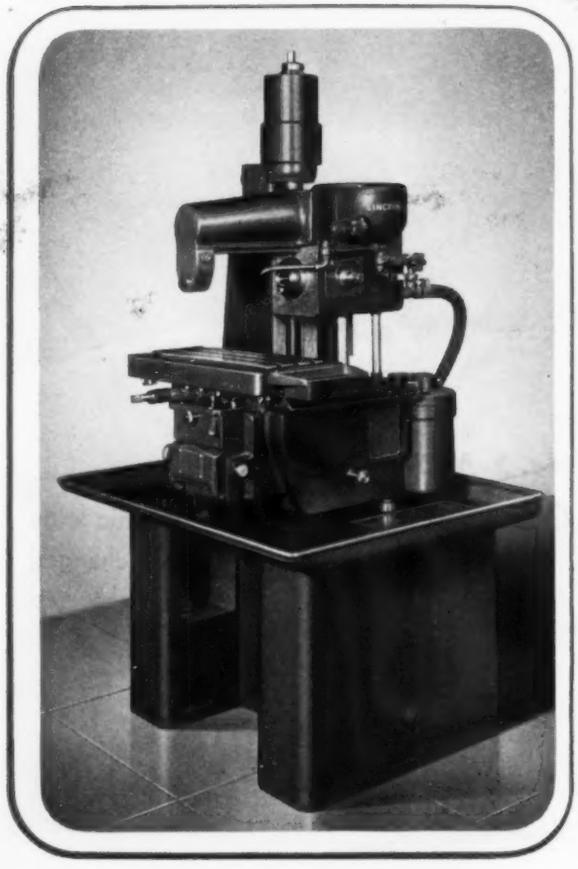
No. 3-A DUOMATIC

Outstanding in the field of automatic lathe equipment. Set-ups and cycles are changed so quickly that new speeds are obtained in both large and small shops.

GET MORE OUT OF YO

WITH CINCINNATI NO. 0-8 PLA

We don't claim to be able to put more working hours in a day, but we do know that each hour will be more continuously productive when you use CINCINNATI No. 0-8 Plain Automatic Milling Machines for your small parts. That's because these millers are completely automatic . . . they're fast, accurate and flexible. In some instances they have stepped up production as much as 50%.



In the milling of small parts, either through cuts or operations where it is not possible for the work to traverse directly into the cut, it's not necessary to adjust table, raise knee to depth of cut, lower knee after milling or make any of the other time-consuming movements required on knee and column machines. On the 0-8 the Rise and Fall Spindle Carrier is timed with table movements which handle all these operations automatically — taking obstruction jumps without touching the controls of the machine.

After the 0-8 is set up, you have no further manual operation except to load the fixture, and even this can sometimes be automatic. Just flip the starting lever and the machine takes over, completing the operating cycle automatically and returning the table to the starting position.

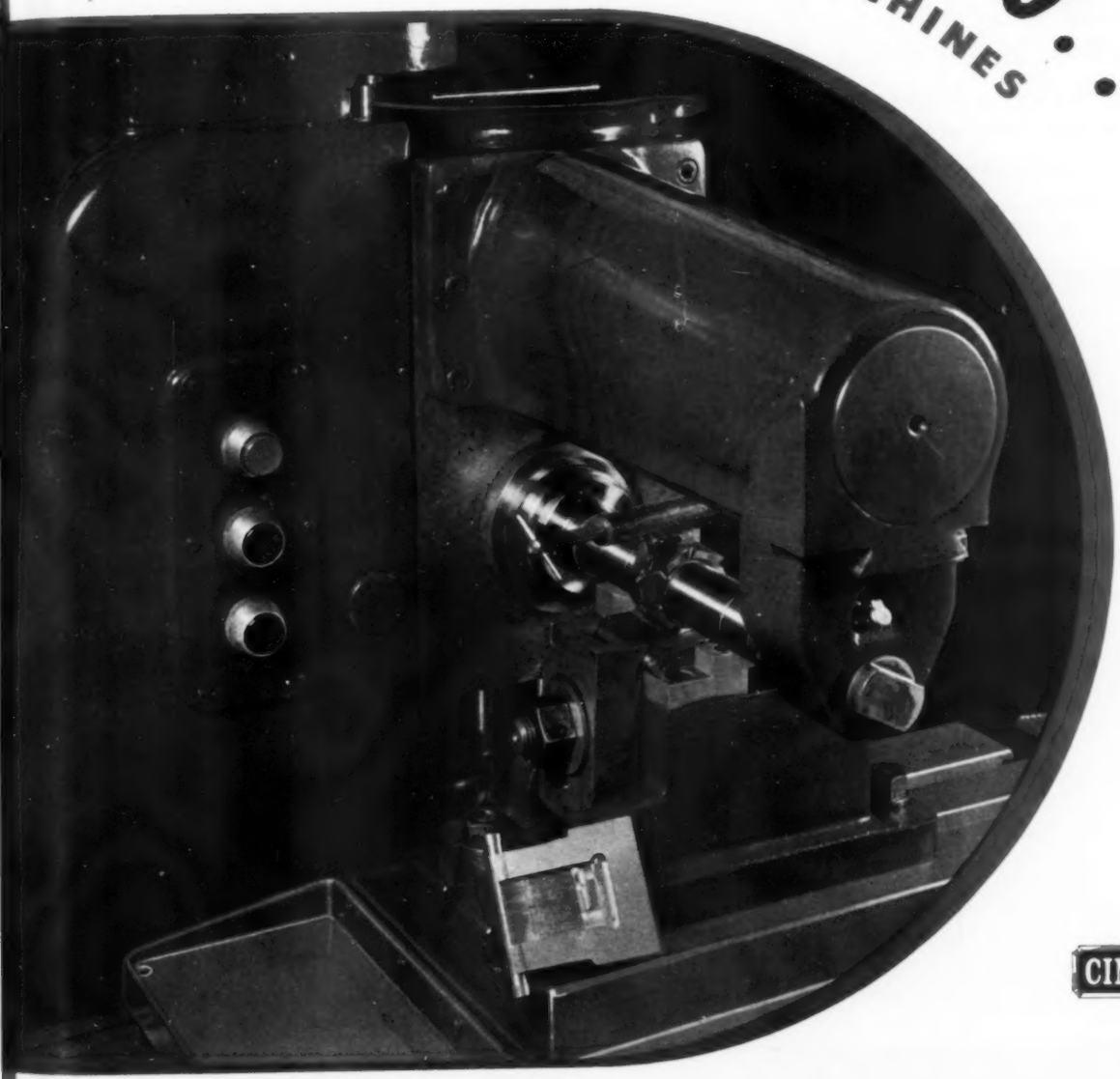
We know you will be interested in complete details on all features of the 0-8 and why they are beneficial. Specification catalog M-964 gives this information. A copy of this book will be sent on request.

SAVE *with a*

Cincinnati!

F YOUR WORKING HOURS . . .

8 PLAIN AUTOMATIC MILLING MACHINES



CINCINNATI

THE CINCINNATI MILLING MACHINE CO.

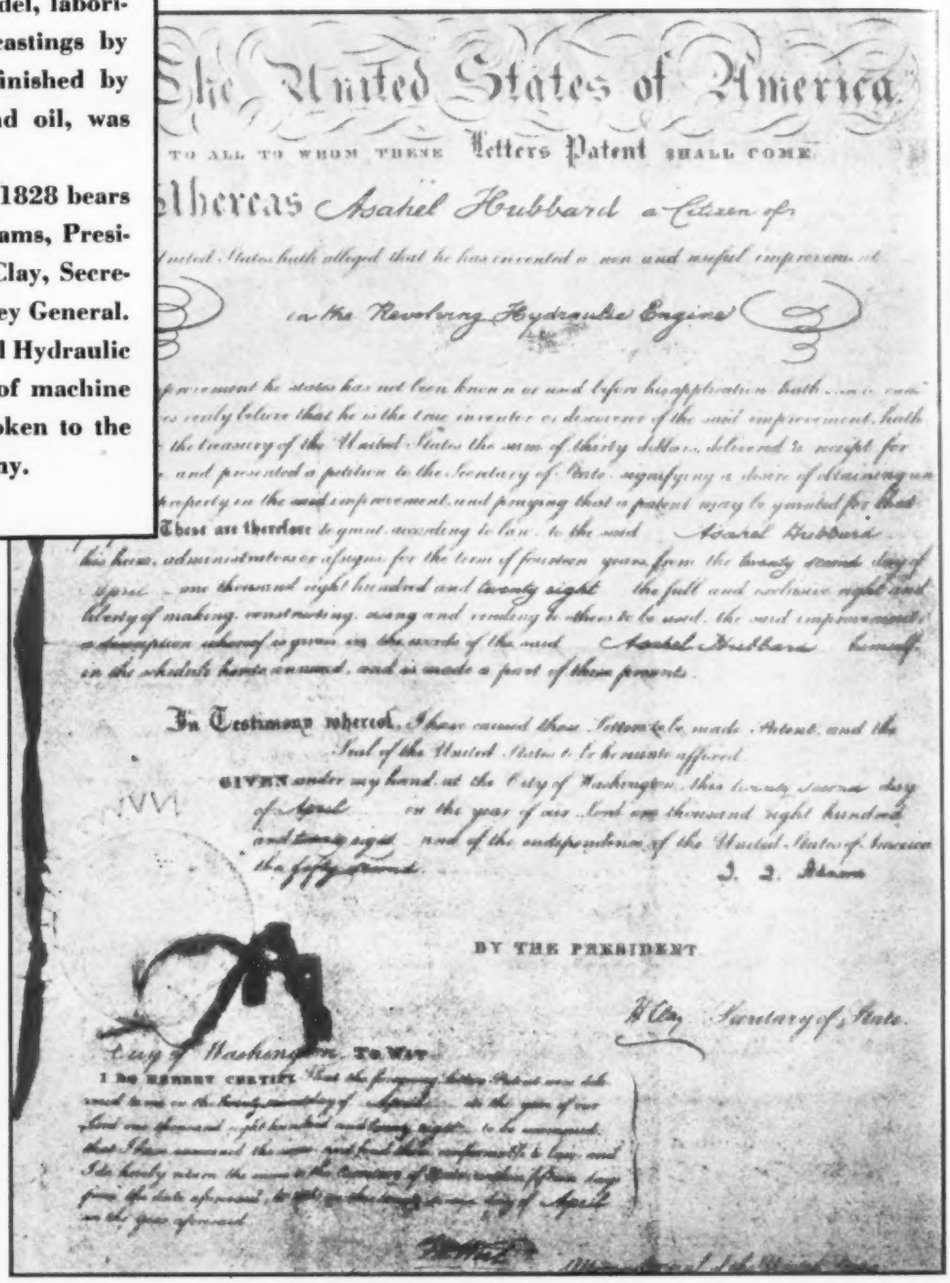
Cincinnati, Ohio U. S. A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES
SURFACE BROACHING MACHINES • CUTTER SHARPENING MACHINES

JOHN QUINCY ADAMS S

At his watermill in the West Parish, Asahel Hubbard experimented with his "Revolving Hydraulic Engine." Models made of wood were tested, rejected, modified and refined. At last a working model, laboriously formed from rough iron castings by the lost art of "chipping" and finished by grinding with powdered glass and oil, was assembled and found successful.

The patent granted April 22, 1828 bears the signatures of John Quincy Adams, President of the United States, Henry Clay, Secretary of State, William Wirt, Attorney General. This marks the birth of the National Hydraulic Company beginning a long chain of machine industries that comes down unbroken to the Jones & Lamson Machine Company.



The United States of America.

TO ALL TO WHOM THESE Letters Patent SHALL COME:

Whereas Asahel Hubbard a Citizen of

United States hath alleged that he has invented a new and useful improvement

in the Revolving Hydraulic Engine

improvement he states has not been known or used before his application hath made oath

he verily believe that he is the true inventor or discoverer of the said improvement, hath

the treasury of the United States the sum of thirty dollars, delivered a receipt for

and presented a petition to the Secretary of State, signifying a desire of obtaining an

property in the said improvement, and praying that a patent may be granted for that

These are therefore to grant, according to law, to the said Asahel Hubbard

his heirs, administrators or assigns, for the term of fourteen years from the twenty second day of

April one thousand eight hundred and twenty eight the full and exclusive right and

liberty of making, constructing, using and vending to others to be used, the said improvement,

a description whereof is given in the words of the said Asahel Hubbard himself

in the schedule hereto annexed, and is made a part of these presents.

In Testimony whereof, I have caused these Letters to be made Patent, and the

Seal of the United States to be hereunto affixed.

GIVEN under my hand, at the City of Washington, this twenty second day

of April in the year of our Lord one thousand eight hundred

and twenty eight and of the independence of the United States of America

the fifty second.

J. Q. Adams

BY THE PRESIDENT

H Clay Secretary of State.

City of Washington, To Wit:

I DO HEREBY CERTIFY that the foregoing Letters Patent were delivered

unto me on the twenty second day of April in the year of our

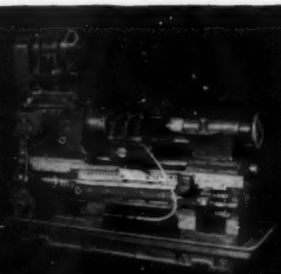
Lord one thousand eight hundred and twenty eight, to be countersigned,

that I have countersigned the same, and found them conformable to law; and

I do hereby return the same to the Secretary of State, to obtain the Seal thereto, from

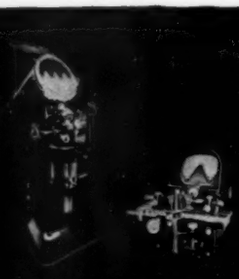
the date aforesaid, to take effect from the twenty second day of April

in the year aforesaid.



FAY AUTOMATIC LATHES

AUTOMATIC THREAD GRINDERS



OPTICAL COMPARATORS

AUTOMATIC OPENING DIE HEADS

IS *Signed our* BIRTH CERTIFICATE

OUR determination to test, reject, modify and refine, links us with the past and points ahead into the future. Whenever invention born of necessity in a time of emergency has developed new materials or new methods, we at Jones & Lamson have been ready with advanced machine tool technique, and those who have depended on us have not been let down.

No matter how preoccupied with today's production problems, you cannot fail to benefit by contacting a company that has so consistently maintained leadership. Whether your organization is large or small your inquiry will receive the careful, detailed study of our engineers.

Send your questions today and ask for our illustrated catalogs.

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MACHINE COMPANY

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

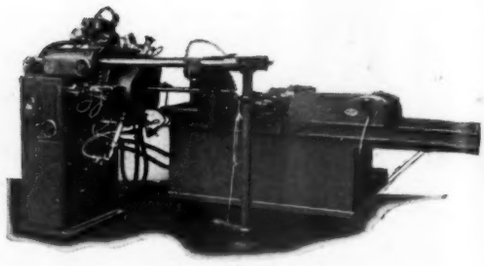
Springfield, Vermont
U. S. A.

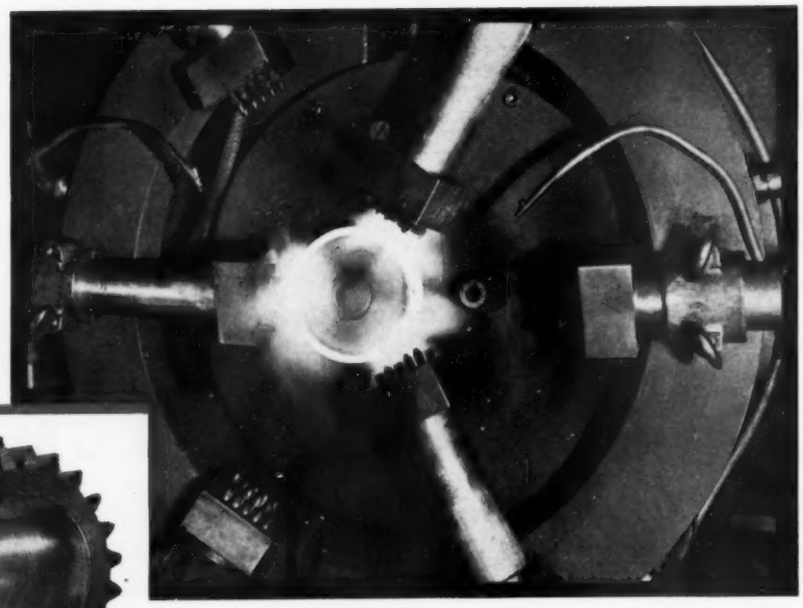
PROFIT PRODUCING
MACHINE TOOLS

SADDLE TYPE
UNIVERSAL TURRET LATHE

RAM TYPE
UNIVERSAL TURRET LATHE

"WE FLAME





Fellows Flame Hardening permitted increasing the Rockwell hardness of the teeth of this thin-wall gear from 42/47C up to 57/60C—and by eliminating distortion, cut overall production time by 17.4%.

Before Fellows Flame Hardening was available, this entire shaft had to be heat treated. Now localized hardening has simplified production to save 33½-minutes per piece—while the gear teeth are brought 14 points higher on the Rockwell "C" scale

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTION

HARDEN 160 DIFFERENT PARTS"

. . . states A Cincinnati Machine Tool Maker

This report on the wide application of the Fellows Flame Hardener adds testimony to the statements we've made regarding the less-than-30-min. change-over in set-up time from one part to another.

But even more important is the ECONOMY effected by controlled localized hardening, and the improved quality of the work achieved by stepping up the degree of hardness of the critical wearing surfaces. Attention is directed to the examples on the opposite page. This extra wear resistance is of utmost importance in these days of sustained overload on machinery of all kinds.

The COST SAVING in flame hardening results generally from the elimination of after-machining operations, since distortion is almost nil.

For descriptive bulletin on Flame Hardening write The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.

. . . . FROM BLANK TO FINISHED GEAR

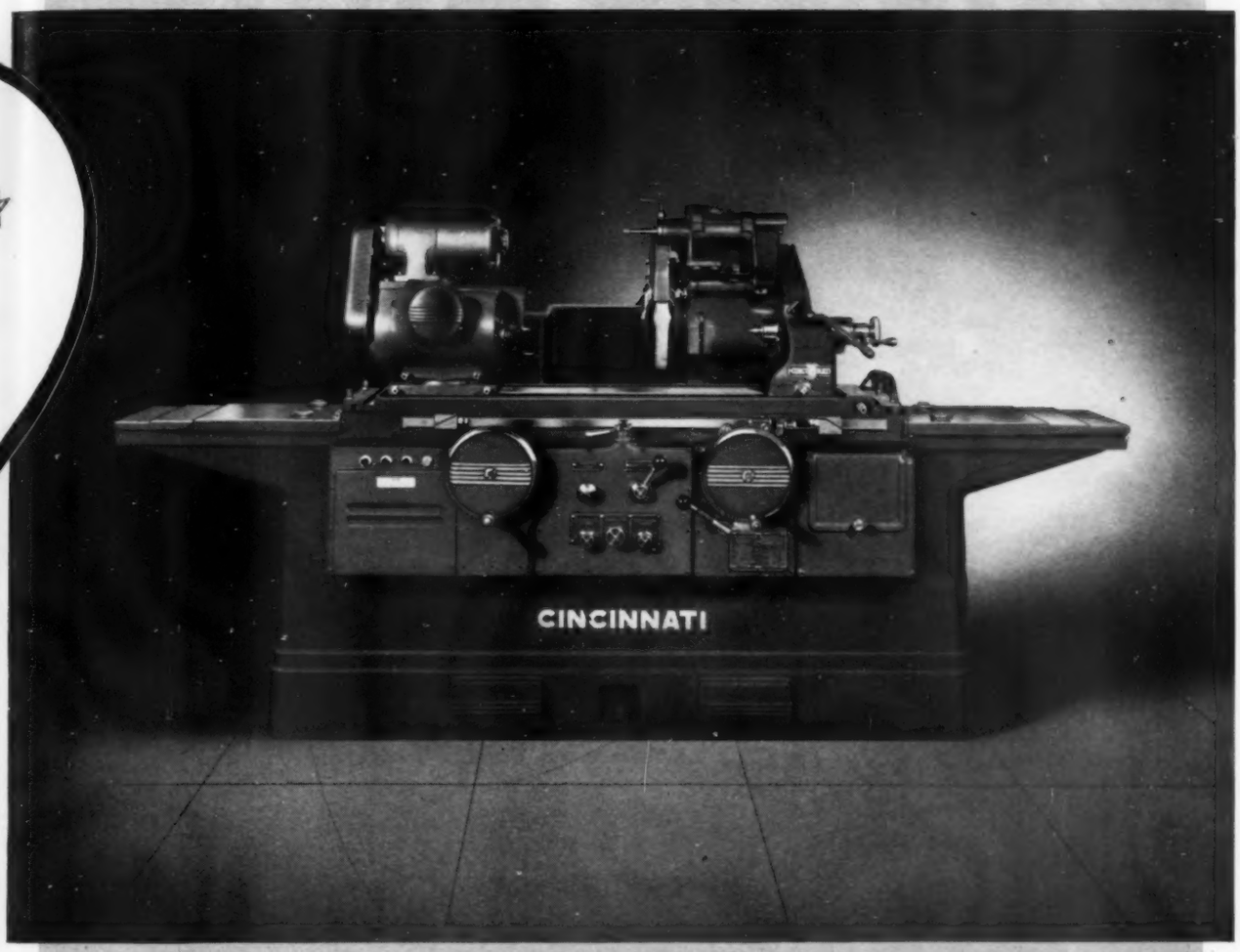
. . . BUT WITH THE SAME *High Quality*

Sure we're turning them out faster than ever before. More men, more advanced productive methods, longer hours are helping to make new production records for us every month. But demands for neither speed nor quantity can make us forget our first responsibility to provide new machine tools which are themselves so accurate and reliable they will be working steadily and efficiently long after the war is over.

Anything that contributes to greater speed and accuracy in the production of wartime and peacetime requirements is of vital importance. And CINCINNATI Hydraulic Universal Grinding Machines do both.

Consider these features: **FILMATIC** Grinding Wheel Spindle Bearings; Hinged Type Internal Grinding Attachment driven by independent motor; Infinitely Variable Work Speeds; Accuracy of Table Reversal Within .004″; Dog-Controlled Table Reciprocation from 3/32″ to Full Table Stroke; Independent Right and Left Hand Cross Traverse; Table Ways Protected by Telescopic Guards. The CINCINNATI Hydraulic Universal is so accurate a .0001″ limit is practical and from start to finish every element of production is faster.

CINCINNATI



CINCINNATI HYDRAULIC UNIVERSAL GRINDING MACHINE

CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16" and 18" swings; between-center distances up to 72". Specification catalogs G-486 and G-474 cover all features and their benefits. Send for your copies today.

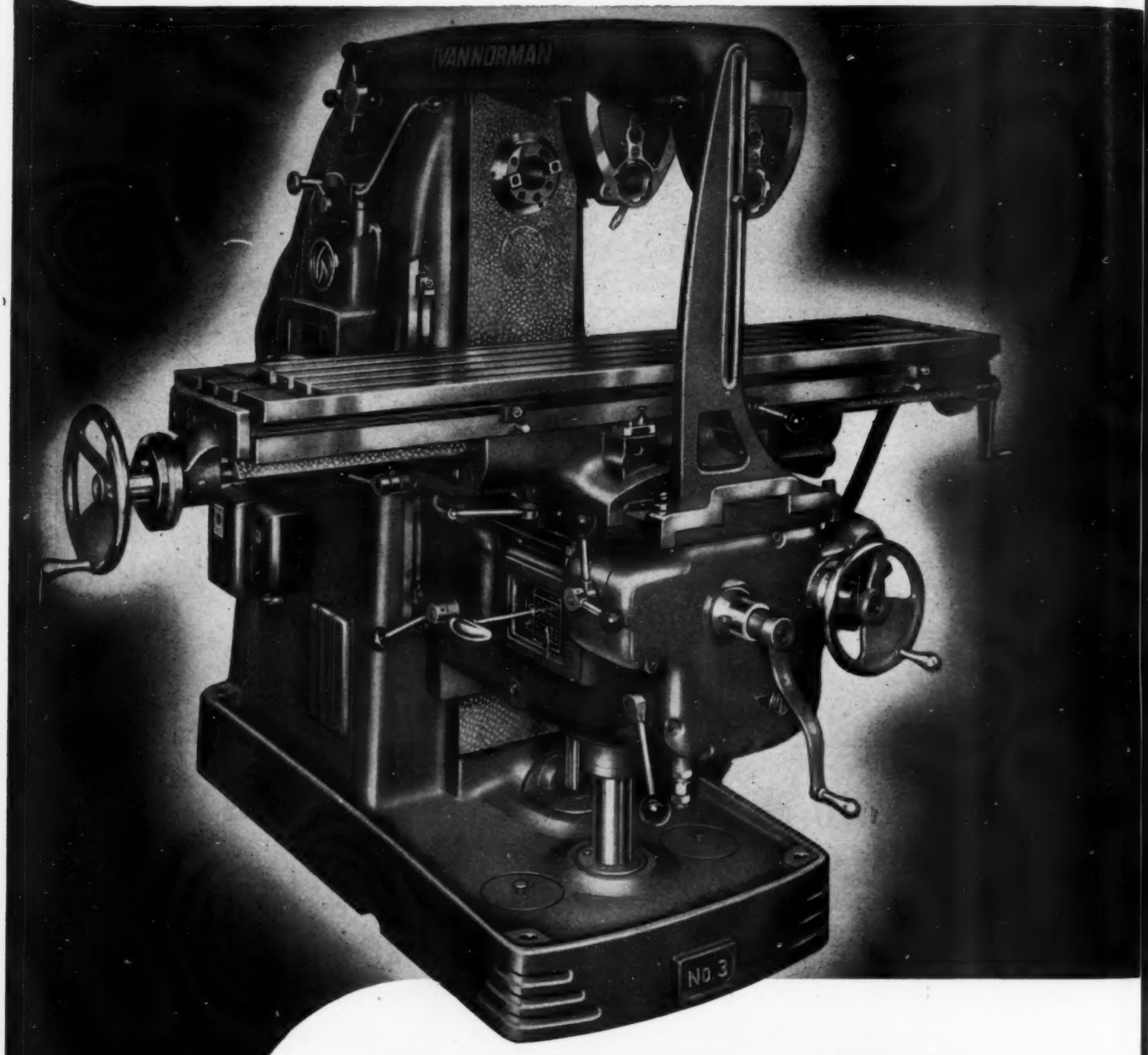
SAVE *with a Cincinnati!*

CINCINNATI GRINDERS INCORPORATED

Cincinnati, Ohio U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES

VAN NORMAN



No. 3-S VAN NORMAN PLAIN HORIZONTAL MILLER offers exceptionally great operating convenience. 18 feeds and 18 speeds (high and low series) are available through single-lever selectors. Table, knee and saddle travel are directionally controlled both from front and rear of machine. And to this ease of control is added exceptional structural strength that permits the heaviest cuts with extreme accuracy. Table: 64" x 14". 18 speeds: rpm. 18 table 25 to 1250 feeds: ⅜" to 32"

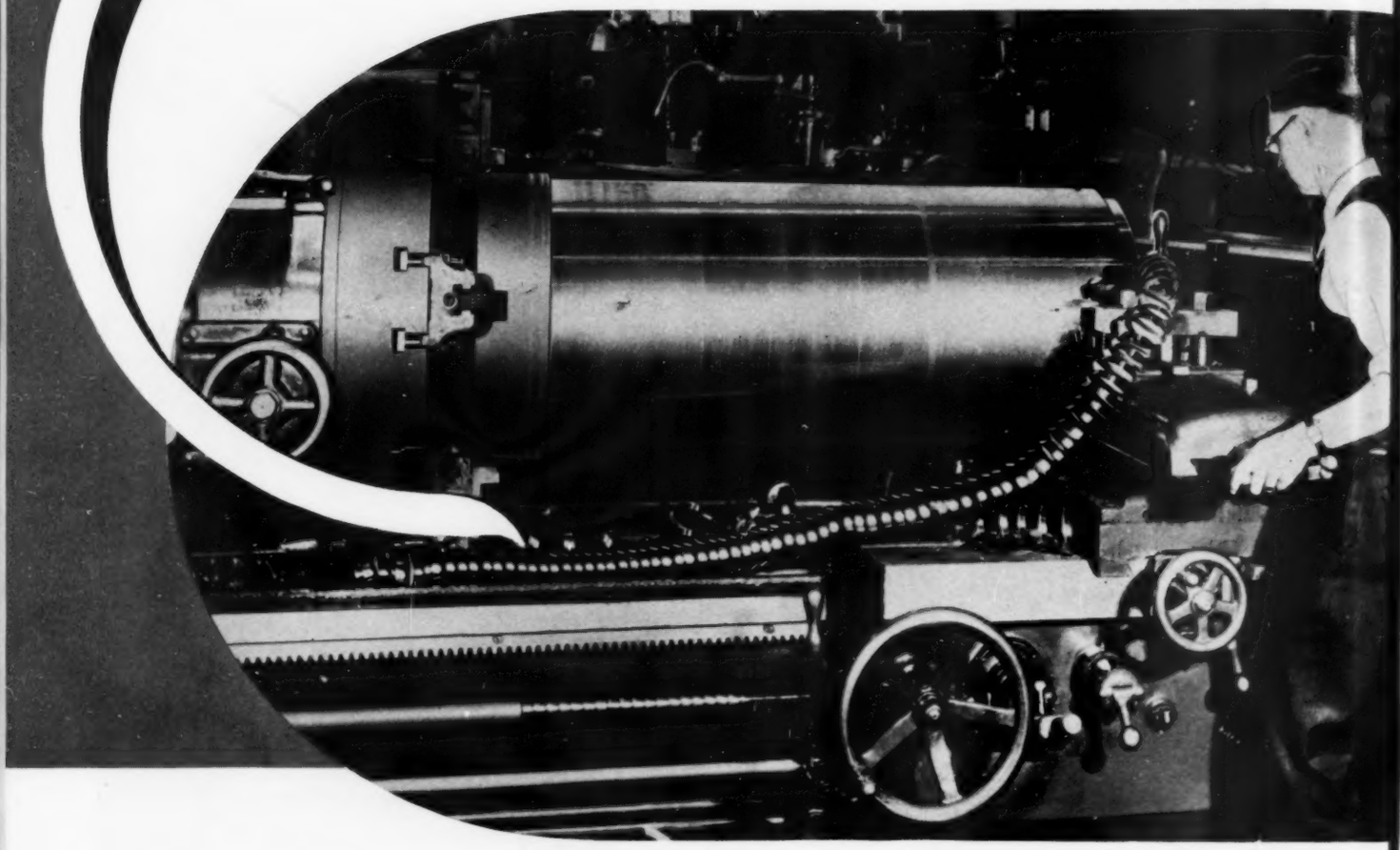
VAN NORMAN MACHINE TOOL

Milling Machines

NO. 118 VAN NORMAN BED-TYPE PRODUCTION MILLER sets new high levels of production on small and medium parts. By setting table-dogs, operator sets up a completely automatic operating cycle. Set-up is quick and easy. Operation and control are entirely hydraulic. Table feeds are infinitely variable, and instantly available thru a dial on the front of the machine. Automatic spindle stop control is available. 12 spindle-speeds: 30 to 1000 rpm. Table feed: 18". Spindle adjustments: 7½" vertical, 3½" cross.

COMPANY • SPRINGFIELD, MASS.

A BIG CUT ON A HUSKY LATHE..



An easy job for a powerful "AMERICAN"

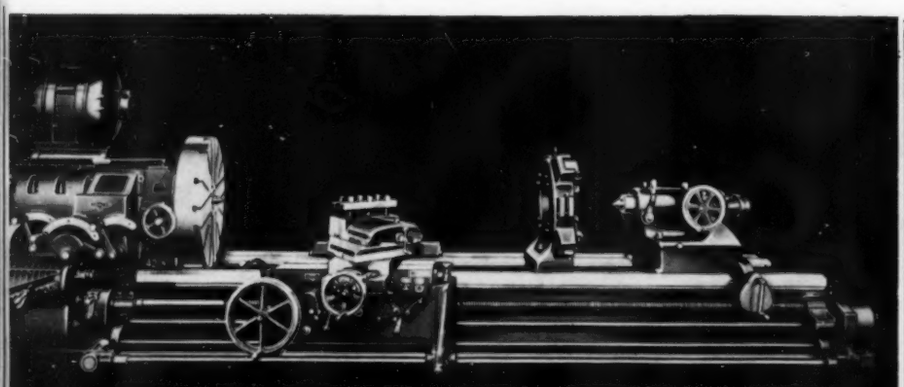
•

This husky "AMERICAN 42" Super Productive Lathe has everything in the way of power and speed for maximum production and savings.

The cut is being taken with a cemented carbide tool on a 24" diameter .60 carbon steel spindle at a speed of 250 F.P.M.

Even a big job like this is easily turned on one of these powerful "AMERICANS" —the lathes that offer those exclusive "AMERICAN" features designed to achieve the maximum in productivity and precision with a minimum expenditure of time and effort.

Investigate the "AMERICAN" way today and be convinced that this is the modern, fast, low cost way to handle your turning operations.



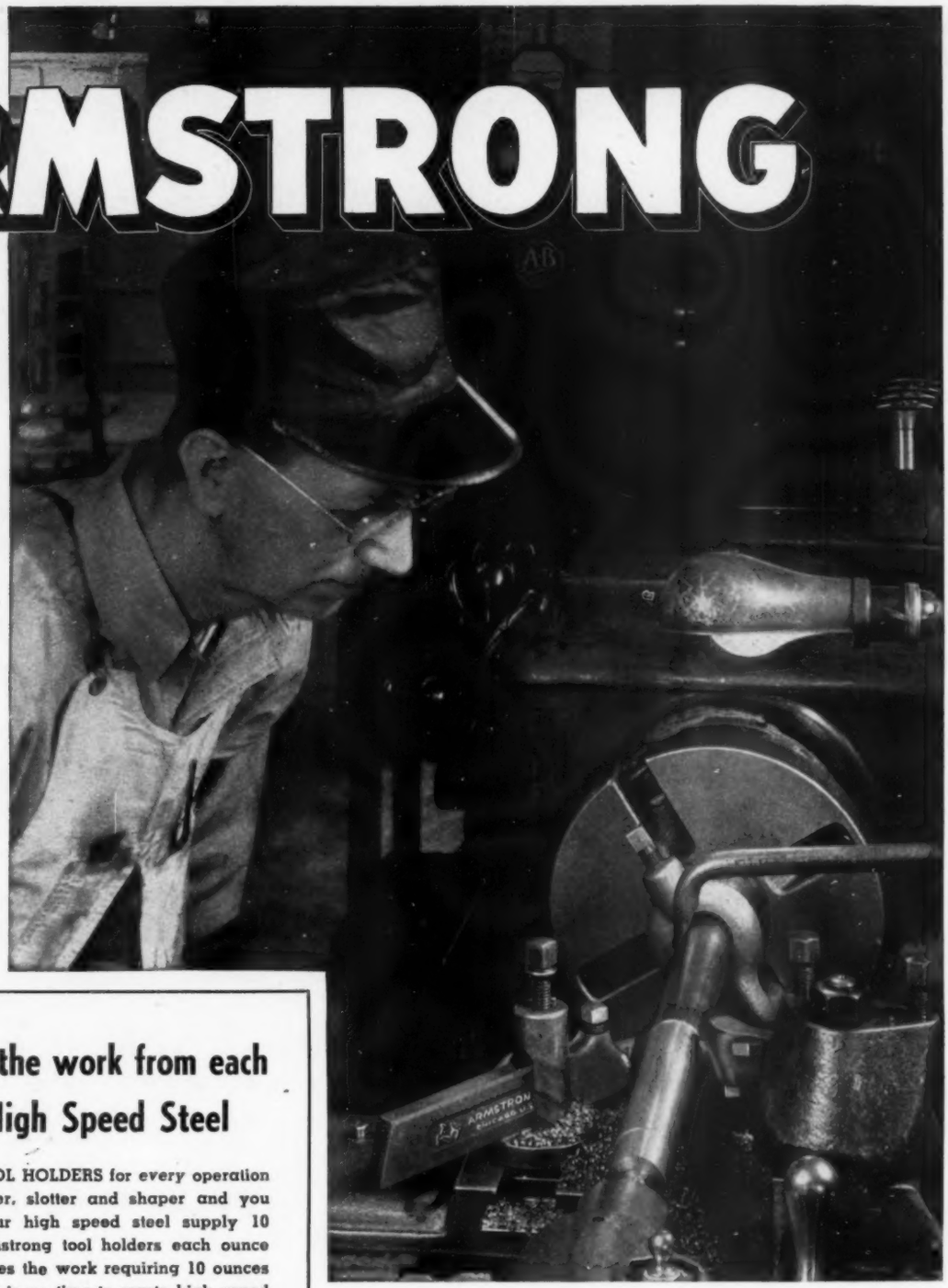
The **AMERICAN**

TOOL WORKS COMPANY

Cincinnati, Ohio, U.S.A.

LATHES • RADIALS • SHAPER

ARMSTRONG



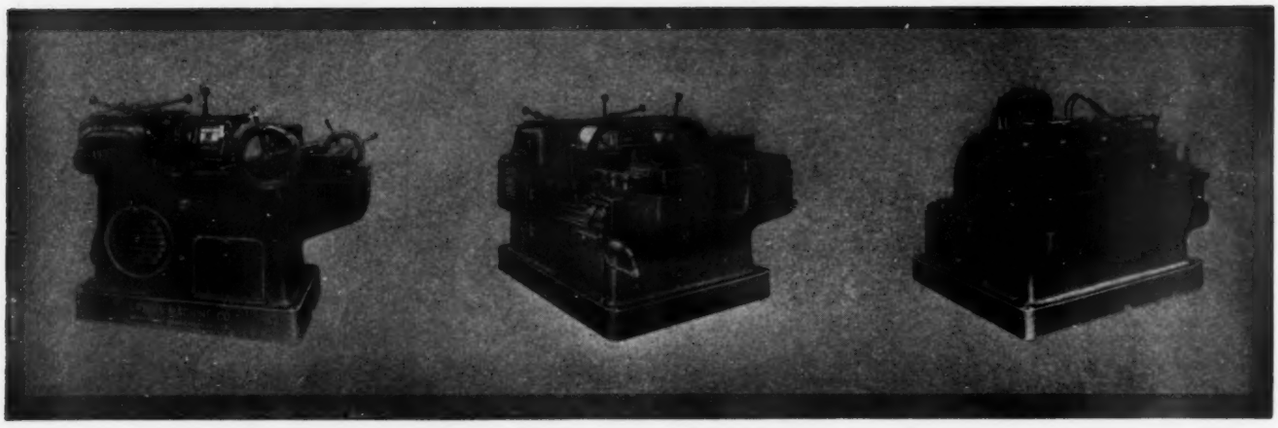
Get 10 times the work from each ounce of High Speed Steel

Use ARMSTRONG TOOL HOLDERS for every operation on every lathe, planer, slotter and shaper and you in effect multiply your high speed steel supply 10 times because in Armstrong tool holders each ounce of high speed steel does the work requiring 10 ounces in a forged tool. This is no time to waste high speed steel, yet that is exactly what you are doing if you are using forged tools for any operation on any lathe, planer, slotter or shaper. The Armstrong System provides tool holders in over 200 sizes and shapes—stronger, correctly designed tools that cut efficiently at speeds and feeds far above those normally used.

Make it a policy to use an ARMSTRONG TOOL HOLDER wherever possible not only to speed-up work but to "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
315 N. FRANCISCO AVE. CHICAGO, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms



LANDMATIC Heads

—designed for fine Thread Accuracy

—built for dependable service

A west coast manufacturer employs the LANDMATIC Head illustrated above to thread adjuster screws made from 3135 S.A.E. steel heat treated to Brinell 217-241.

The thread, 1¼" diameter, 5 pitch Acme 1⅞" long is produced at a cutting speed of 10' per minute. The threads are held to close tolerance specifications.

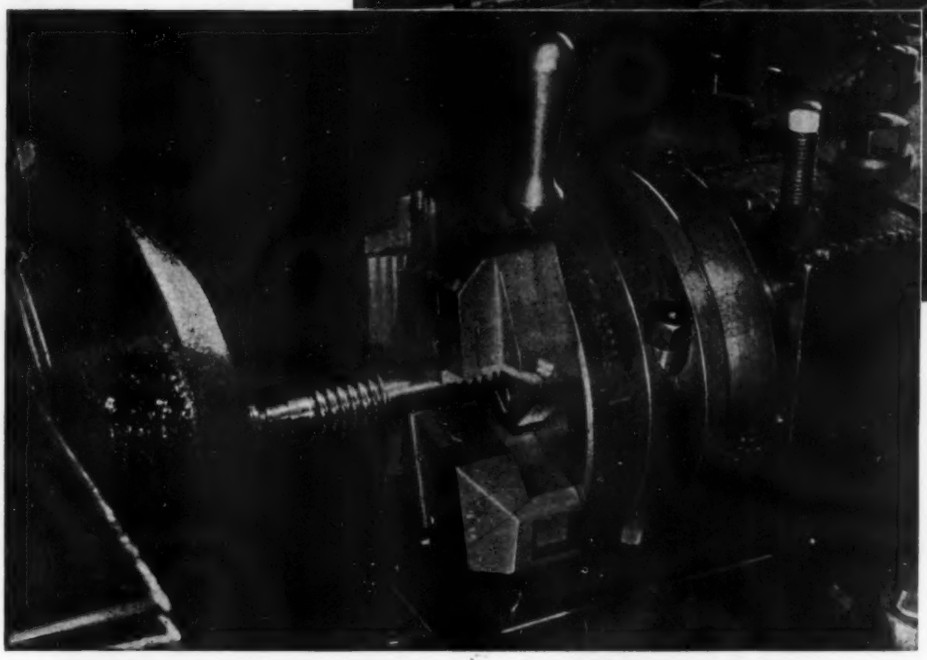
This 2" LANDMATIC Head has been in continuous service for 15 years, assuring the manufacturer accurate dependable thread cutting service. The Landis Tangential Chaser assures low tool cost.

Investigate the LANDMATIC Head as a means for the accurate, low cost threading of your threaded parts. ***Write for Bulletin No. F-90.***

LANDIS

MACHINE COMPANY, Waynesboro Pennsylvania

LANDIS
REG U.S. PAT. OFF. TRADE—MARK



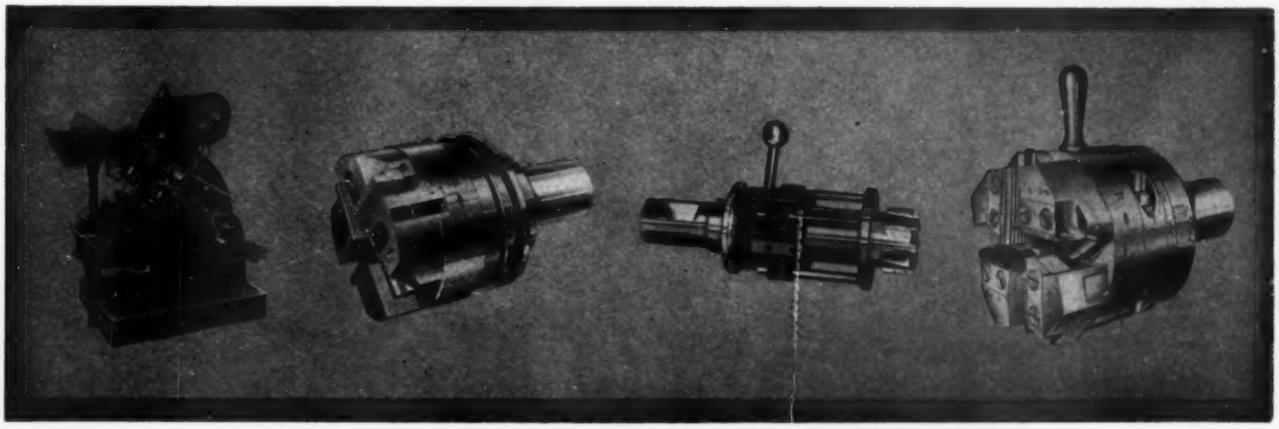
BE THREADWISE—LANDISize

for Fine Accuracy and Dependable Thread Cutting service

The LANDIS LINE

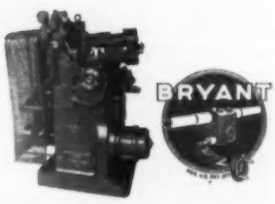
- STANDARD THREADING MACHINES
- LANDMACO THREADING MACHINES
- BOLT FACTORY THREADERS
- AUTOMATIC FORMING AND THREADING MACHINES
- PIPE THREADING AND CUTTING MACHINES
- PIPE AND NIPPLE THREADING MACHINES
- ROLLER PIPE CUTTERS
- CHASER GRINDERS
- ROTARY BOLT THREADING DIE HEADS
- STATIONARY PIPE DIE HEADS
- LANDMATIC HEADS FOR TURRET LATHES
- LANDEX HEADS FOR AUTOMATIC SCREW MACHINES
- LANCO HEADS FOR HAND-OPERATED THREADING MACHINES
- LANDIS COLLAPSIBLE AND ADJUSTABLE TAPS

—and the LANDIS PRECISION THREAD GRINDER



Dictate a me

to Bryant



Don't wait until you get stuck on a problem of internal grinding. Even though it looks relatively simple, dictate a memo to Bryant and mail it to Bryant with blueprints.

Bryant engineers may possibly uncover more than one difficulty that is not at first apparent — uncover it and overcome it.

That often happens when they dig under the surface on a simple looking job. Almost as often Bryant engineers also reveal unexpected ways to combine operations, to cut costs and reduce spoilage.

And please remember that it will not obligate you to dictate a memo to Bryant. Bryant production capacity has already been tripled, and it is constantly increasing. Every day Bryant engineering studies are being rushed for manufacturers with defense contracts. At the same time, Bryant engineers are also pushing steadily ahead with plans for far-sighted firms — plans for cutting costs and increasing profits on peace time products for tomorrow's markets.

If you too believe in planning ahead for post-war profits, let Bryant engineers begin to help you at once. It will not obligate you to dictate a memo to Bryant.

BRYANT CHUCKING GRINDER CO.

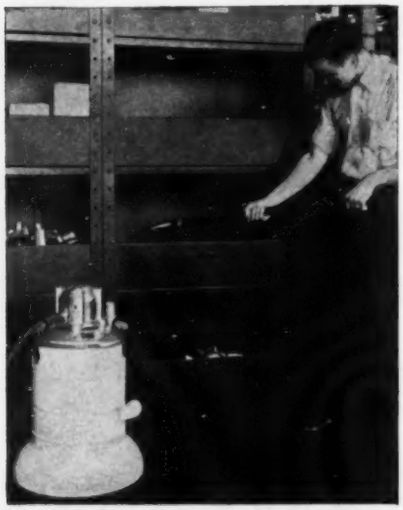
SPRINGFIELD, VERMONT, U. S. A.

SHOOT FOR GREATER ARMAMENT OUTPUT

with BLACK & DECKER Electric Tools

HOLGUNS KEEP 'EM FLYING. These Black & Decker "handfuls of power" speed up drilling in aircraft wings and other assemblies. The "ace" production tools in top flight aviation plants.

ELECTRIC DIE GRINDERS shift armament output into high gear. Use these Black & Decker precision Die Grinders for close-tolerance work on casting, stamping and forging dies.



VACKAR Portable Electric Cleaner removes dirt and dust from floors, walls, bins and pipes. A powerful, compact Black & Decker unit that "tows by the hose."

ELECTRIC TAPPERS give precision tapping results—8 times faster than hand. These B & D Tools accurately thread in all shapes of assemblies and greatly minimize tap breakage.

BLACK & DECKER Portable Electric Tools enable industry to raise its armament output, by speeding up hundreds of production operations. Because they are quality-built and abundantly powered, they perform tough production jobs easier, faster, with greater efficiency, less fatigue.

Black & Decker makes the exact type Portable Electric Tool you need—in any quantity—to speed up your assembly lines. Black & Decker's nation-wide field force gives dependable tooling-up advice . . . a convenient and informed source of tool supply is available from leading distributors in all principal cities . . . and you minimize delays by obtaining prompt repair and parts service from 26 Factory-owned Branches located coast-to-coast. Your jobber stands ready to demonstrate Black & Decker Electric Tools *engineered* to solve your specific problems.

FREE! New 1942 Tool Catalog

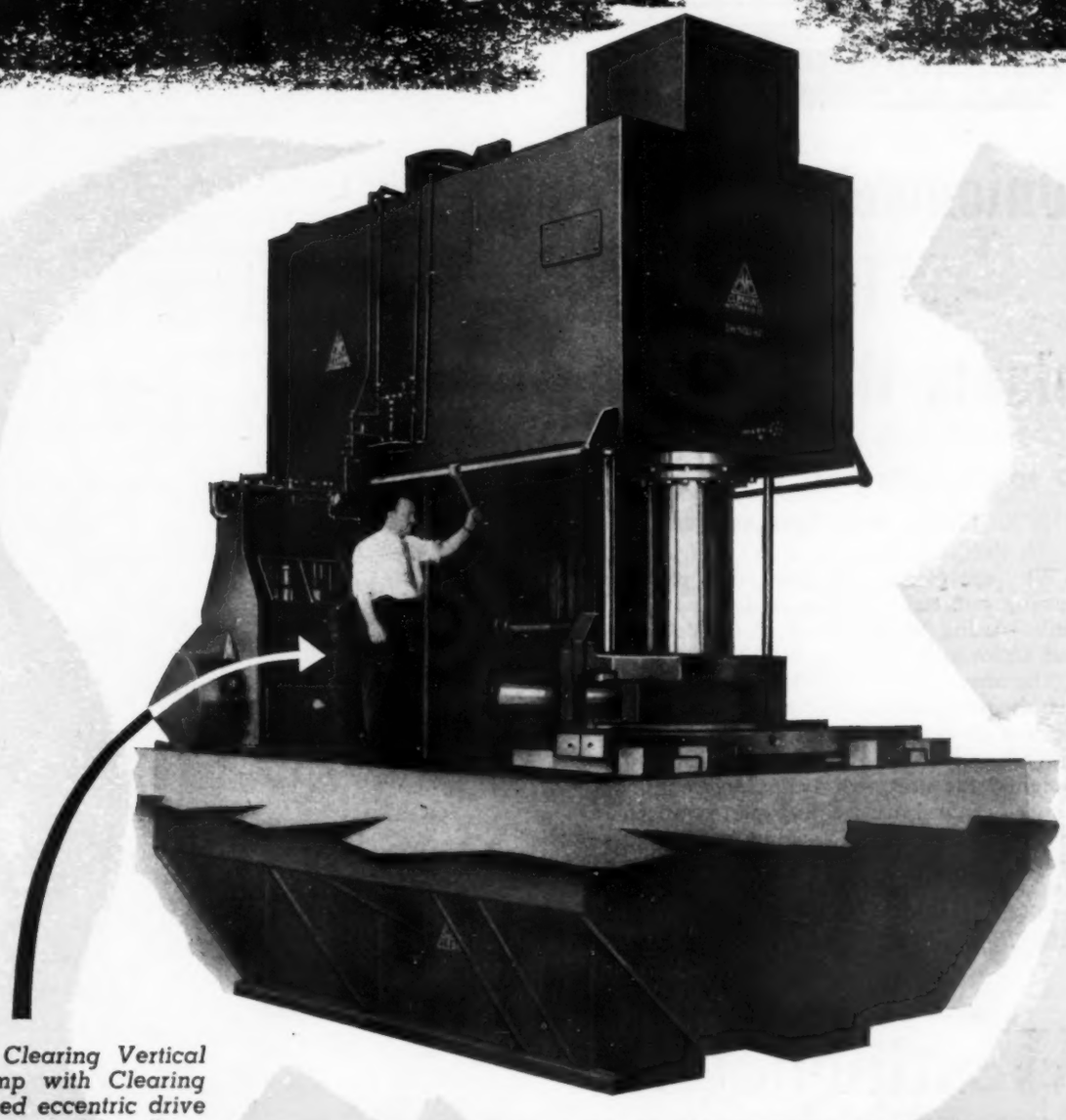
Write for Black & Decker's New Catalog, describing over 100 different types of Electric Tools for production, plant maintenance and construction. Address: The Black & Decker Mfg. Co., 716 Pennsylvania Ave., Towson, Maryland.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

For the defeat of the aggressors



Driven by Clearing Vertical Triplex Pump with Clearing fully enclosed eccentric drive running in oil. Built in all capacities and for all pressures. Clearing engineers will gladly assist you with your press problems.

MODERN CLEARING HYDRAULIC AND MECHANICAL PRESSES

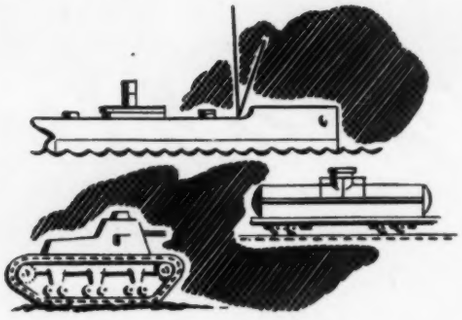
are imbued with the spirit of the coming offensive. You will find them in many plants from coast to coast doing most important work. Light jobs such as drawing small cartridge cases to the mighty job of forging propeller shafts.

The press illustrated is used in the fabrication of welded gun mounts. Its power of 500 tons pressure, under most sensitive control gives the guns the base for their firm and true aim.

It saves time with its facility for quick and easy handling of the work.

CLEARING MACHINE CORPORATION
6499 WEST 65th STREET, CHICAGO

CLEARING
MACHINE CORPORATION
CHICAGO



...Unionmelt-welded in plants like these...

to speed guns and planes and ships and tanks!

Why are plants like these—the plants turning out today's guns and ships and tanks—using Westinghouse A-C Welders and Unionmelt* Process welding?

The answer is that this happy combination helps speed up further the fastest welding process available.

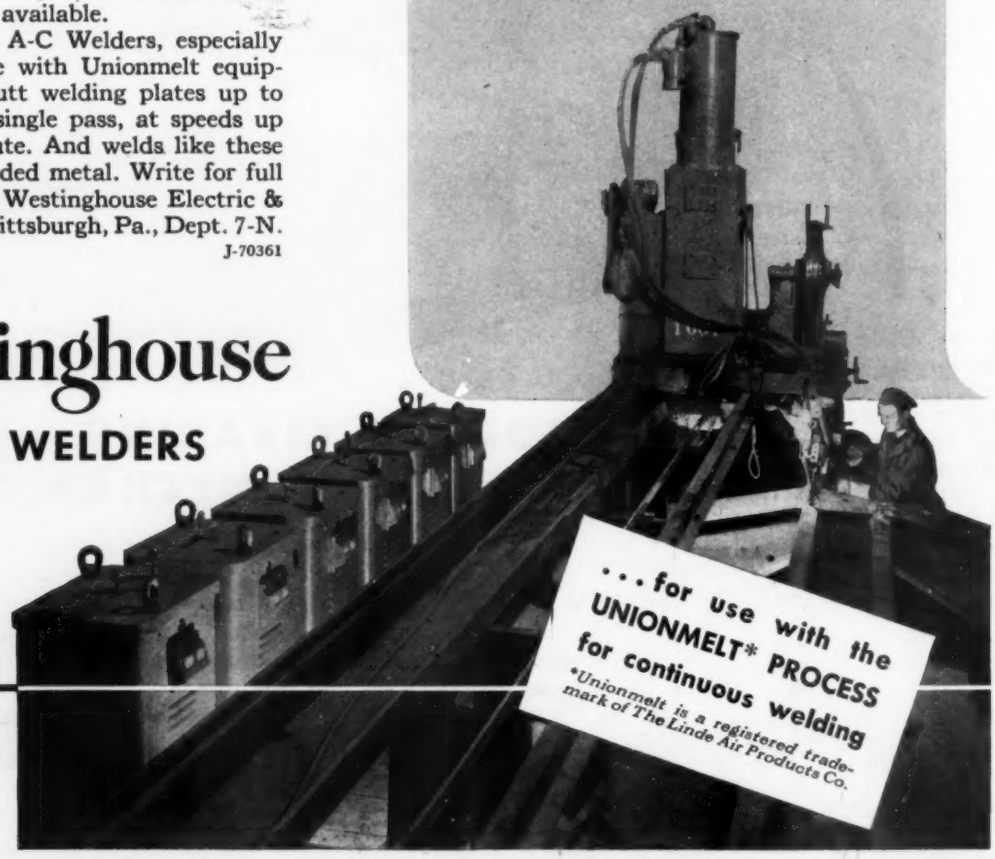
Westinghouse A-C Welders, especially designed for use with Unionmelt equipment, permit butt welding plates up to ½" thick in a single pass, at speeds up to 80" per minute. And welds like these save tons of needed metal. Write for full details. Address Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

J-70361

An eastern railroad car builder
An Ohio steel company
A Great Lakes builder of ore carriers
A large holder of contracts for naval and merchant marine shipping
A large Pennsylvania steel company
A large midwest steel fabricator
A large marine boiler manufacturer
A large electrical equipment manufacturer
A Gulf Coast shipbuilder
A Delaware River shipbuilder
A large New Jersey shipbuilder
A large builder of tank cars
A Mississippi shipbuilder
A Louisiana shipbuilder
A large California shipbuilder
A Chesapeake Bay builder of naval vessels
A large New Jersey holder of naval contracts
An Oregon shipbuilder
A large freight car builder
A passenger car builder
A large holder of tanker contracts
A Washington shipbuilder

Westinghouse

A-C WELDERS

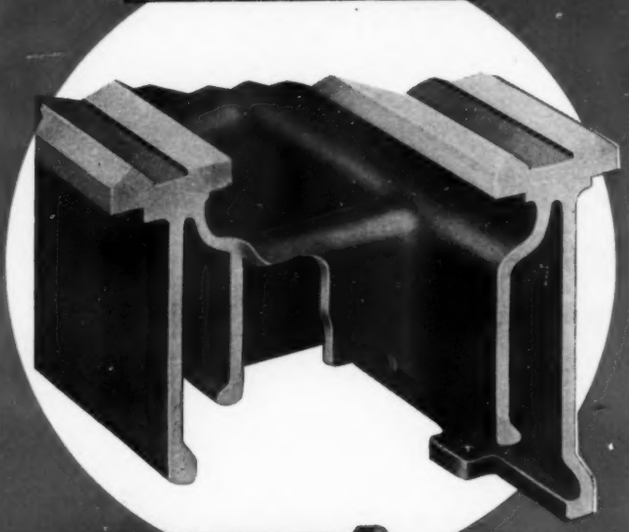

. . . for use with the
UNIONMELT* PROCESS
for continuous welding
*Unionmelt is a registered trademark of The Linde Air Products Co.

STURDY from the Base up ...

Sidney Lathes

SIDNEY

THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO, U.S.A.

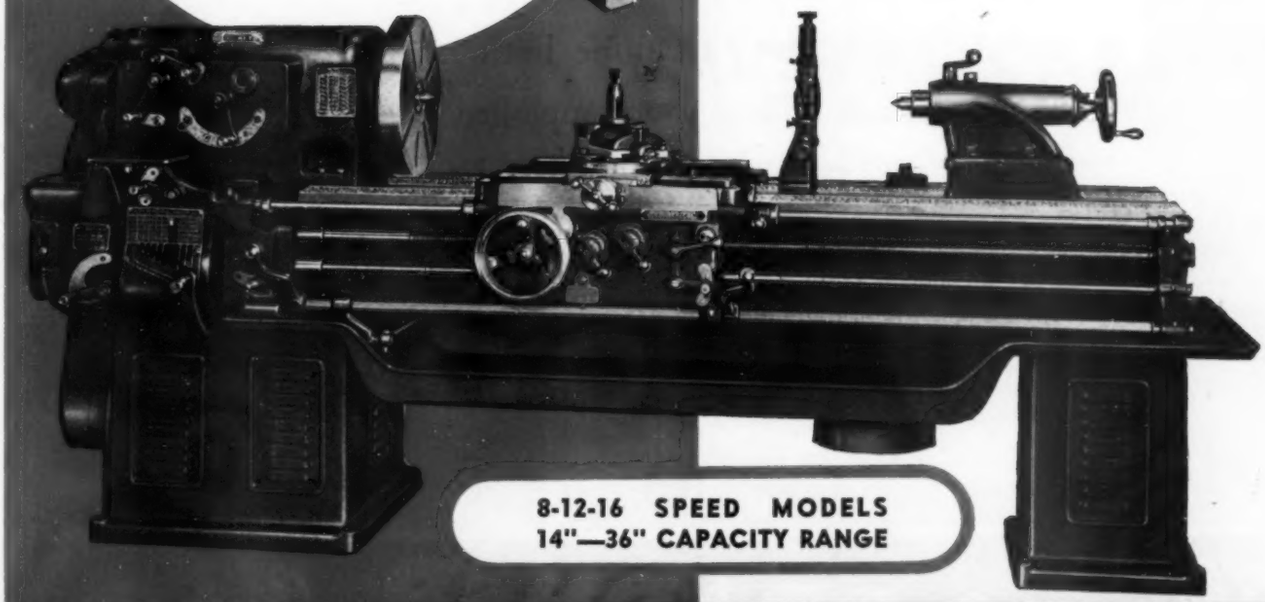


Sound engineering from the base up results in a superb machine tool with several outstanding features which definitely improve production and assure dependable accuracy over a long span of profitable years.

RIGID BED CONSTRUCTION

One of these features is the Bed of the Sidney Lathe. Four longitudinal walls (as illustrated) with cross girts at 12" intervals resist deflection and twisting strains. This type of bed supporting the various units of the lathe is essential to eliminate vibration and assure continued accuracy.

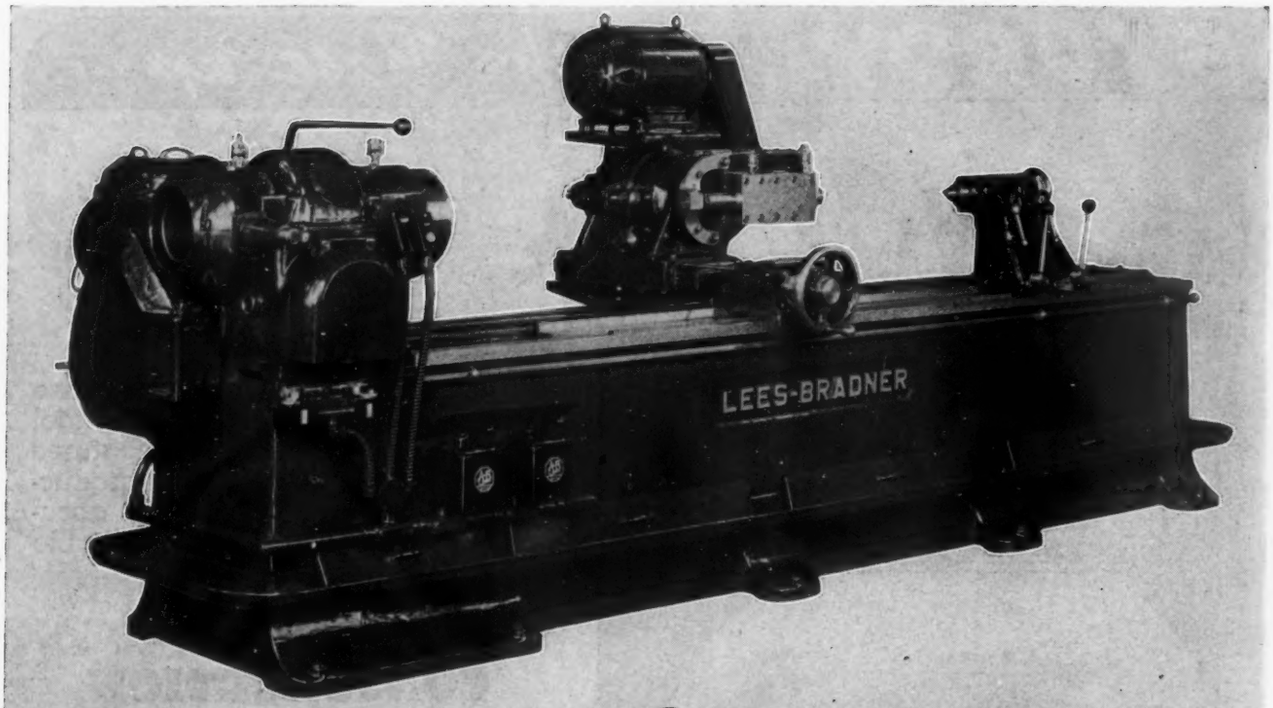
Complete details described and illustrated in available bulletin.



8-12-16 SPEED MODELS
14"—36" CAPACITY RANGE

The SIDNEY MACHINE TOOL Company

SIDNEY U.S.A. OHIO

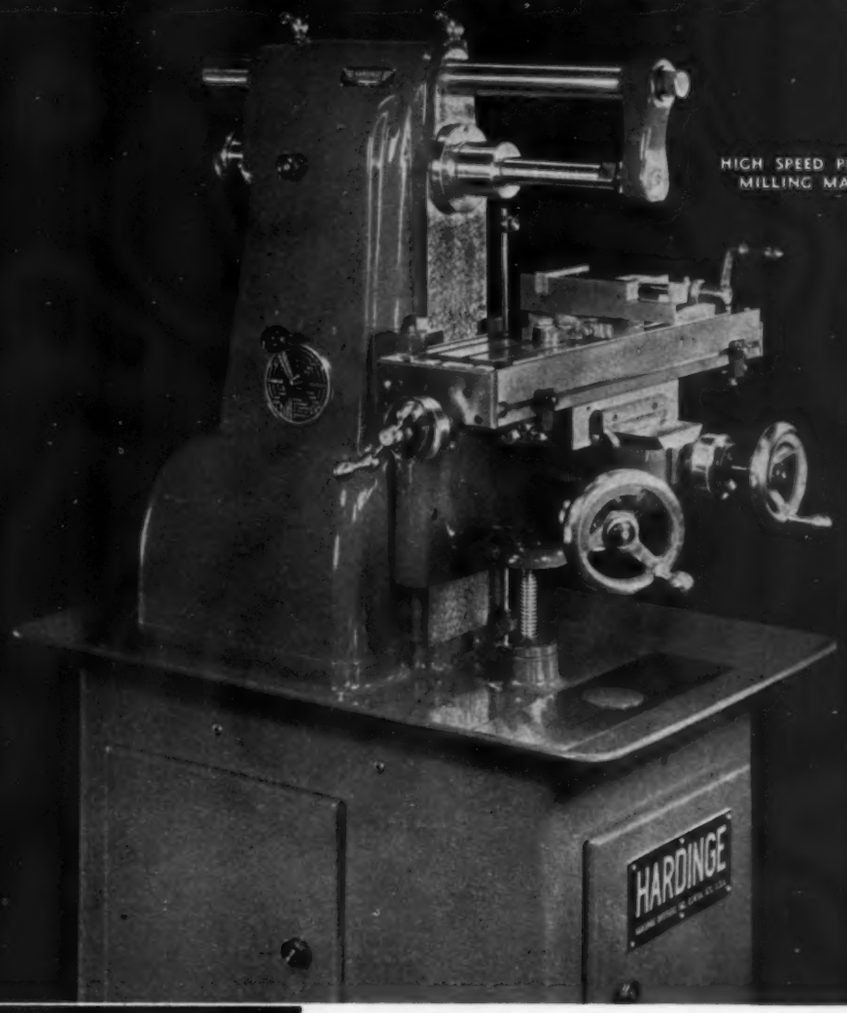


Time Saved is Production Gained
with Model HT
LEES-BRADNER Thread Milling Machine

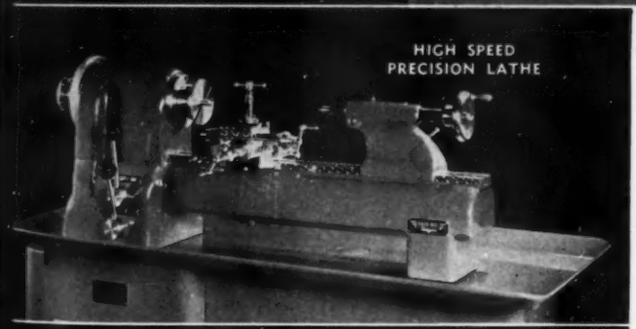
On this heavy duty machine both internal and external thread milling is accomplished with either a disc or ring type cutter at feeds and speeds for in excess of previous practice. Users report savings as high as 70% with finishes superior to former methods —thus time saved is production gained.

The LEES-BRADNER Company
CLEVELAND, OHIO, U.S.A.

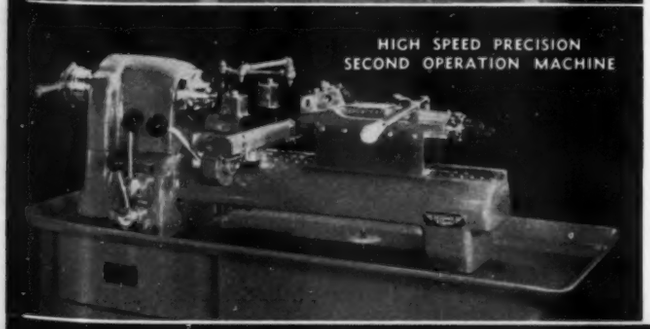
HARDINGE



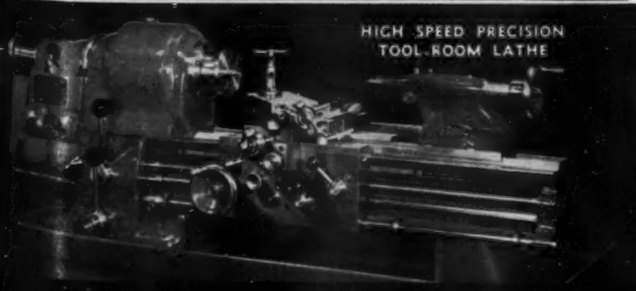
HIGH SPEED PRECISION
MILLING MACHINE



HIGH SPEED
PRECISION LATHE



HIGH SPEED PRECISION
SECOND OPERATION MACHINE



HIGH SPEED PRECISION
TOOL ROOM LATHE

UNUSUAL CAPACITY

(No. 3 of a Series)

Hardinge pioneered the feature of having ample collet capacity. While always desirable, this feature is of particular value today. With it is combined the Hardinge preloaded ball bearing spindle construction, providing a range of spindle speeds for the proper machining of bar material, varying from 1/32" to 1" diameter or chucked work to 5" diameter.

The Hardinge 1" collet capacity is not through the use of a sleeve or other arrangement, but is direct in the spindle to provide the greatest degree of accuracy.

Another added advantage is that, with Hardinge, there is a matched relation between the various machines for interchangeability of collets, as well as a number of other attachments used in the spindle of each machine.

"Specify Hardinge and you are assured of engineered efficiency."

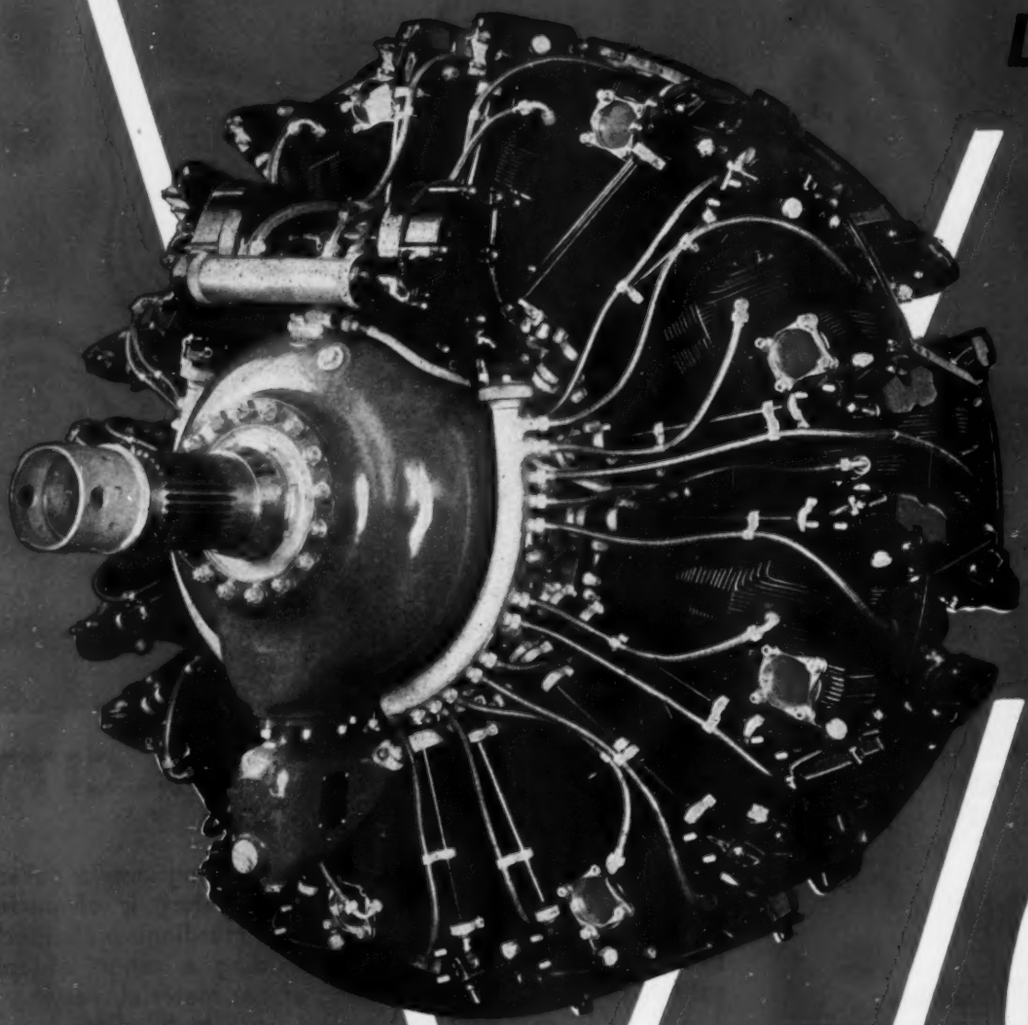
HARDINGE BROTHERS, INC.

ELMIRA, N. Y.

"Performance has established leadership for Hardinge"

ANSWERING

in terms



Victory

—with

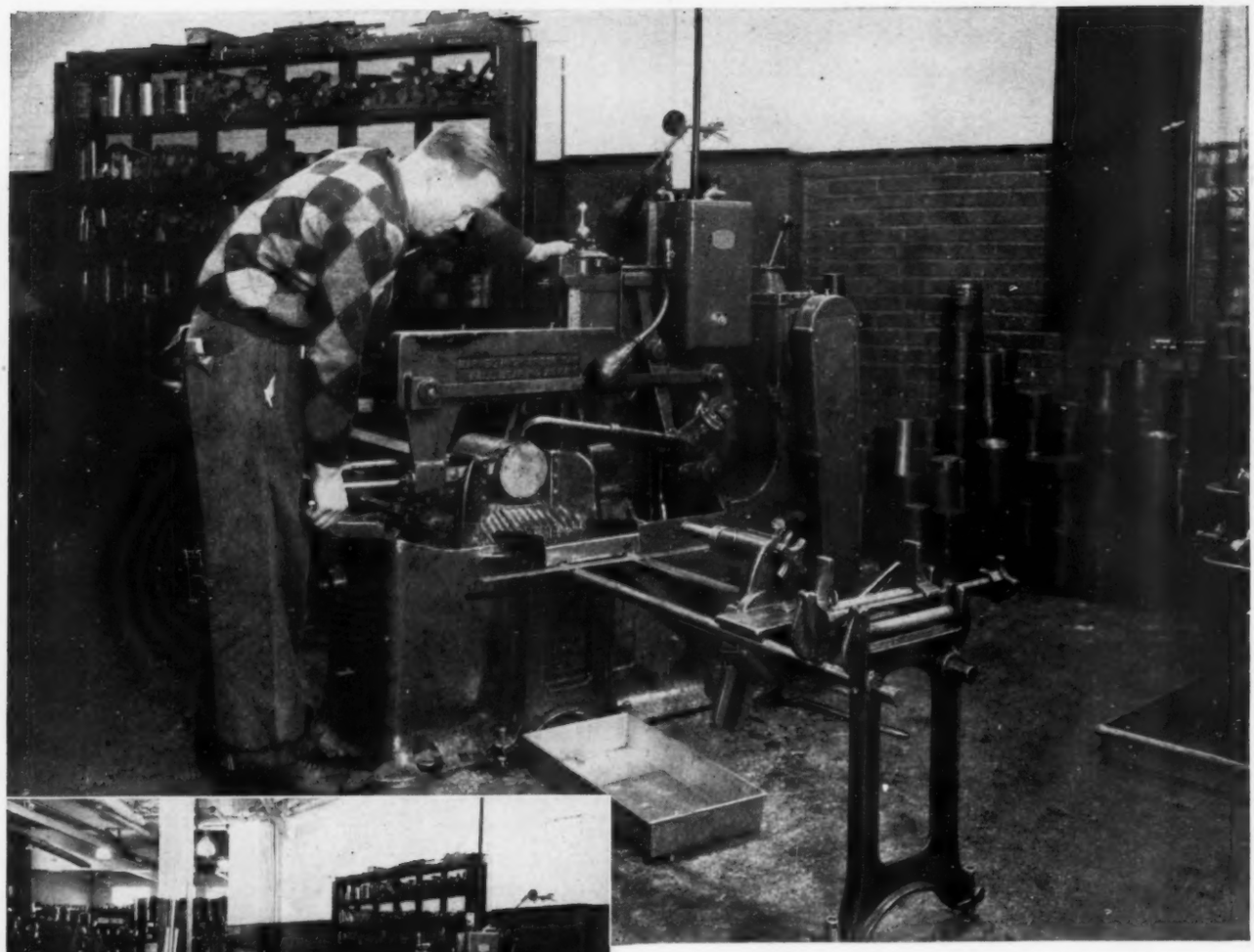
POTTER & JOHNSTON

THE AXIS
of Aircraft Production . . .

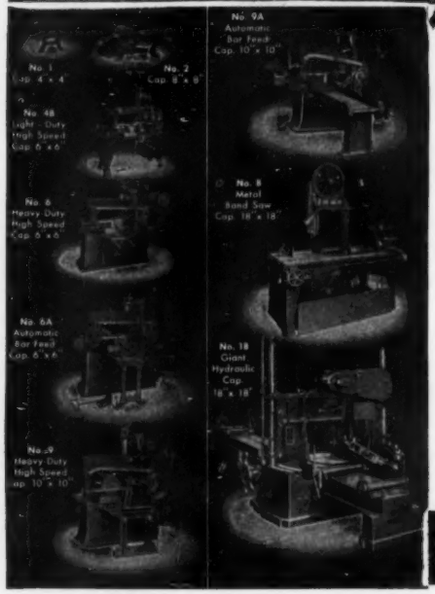
An outstanding factor contributing to the defeat of the Axis is the American ingenuity for transforming limited quantity production plants into large quantity producers within a remarkably short period of time. In this, P&J engineers and equipment figure prominently. The many vexing machining problems which present themselves to aircraft production engineers, for example, have been solved with phenomenal success with P&J Automatics and toolings—as evidenced by the following actual case records selected at random: Propeller Cams (steel forgings, 415 Brinell) requiring some 29 machining operations, with certain limitations imposed as to cutting speeds and feeds, are completed in the floor-to-floor time of 164.35 minutes per piece. Propeller Shafts (steel forgings, 321 Brinell) require large stock removals and extremely fine finishes, including a number of stepped borings—P&J floor-to-floor time, 41 minutes per piece. Aircraft Cylinder Barrels (steel forgings, 269 Brinell) are completely machined in one cycle of a P&J Two Spindle Automatic, including some 16 machining operations, at the rate of 4.8 cylinders per 51-minute hour per machine. Not only speed, but Economy is another important P&J factor; one operator often handles 2 and 3 P&J Automatics on work similar to that described above.

POTTER & JOHNSTON MACHINE CO., PAWTUCKET, R. I.

TORY
AUTOMATICS



MARVEL SAWS



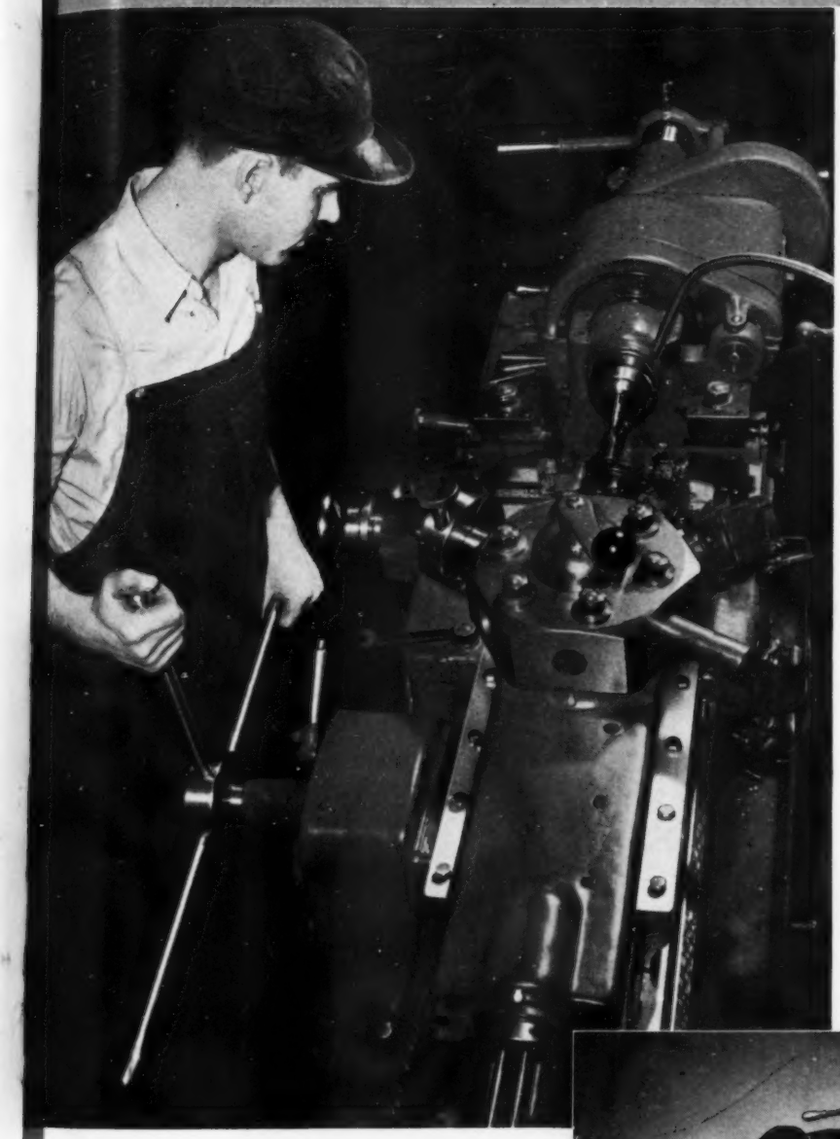
Cutting-off continuously at high speed at Wright Aeronautical Corporation.

These MARVEL PRODUCTION SAWS at the Wright Aeronautical Corporation, Paterson, N. J., have operated continuously; have been cutting-off "round and square stock, all kinds of alloy steel up to 10" D, and 10" Sq. and giving A-1 satisfaction."

When photographed, the MARVEL 9A was cutting-off S.A.E. 3140 Steel Tubing, $3\frac{1}{8}$" O.D. x $1\frac{7}{8}$" I.D. at the rate of a piece every minute and a half, while the MARVEL 6A was cutting a slice from a $5\frac{1}{2}$" D. Cold Rolled Steel bar every six minutes. These heavy duty all ball-bearing saws with automatic bar push-up, will cut-off more pieces, floor-to-floor, than any other cutting-off machine or method.

ARMSTRONG-BLUM MFG. CO. *"The Hack Saw People"*
5700 Bloomingdale Ave., Chicago, U.S.A. Eastern Sales: 225 Lafayette St., N. Y.

Production Plus Precision



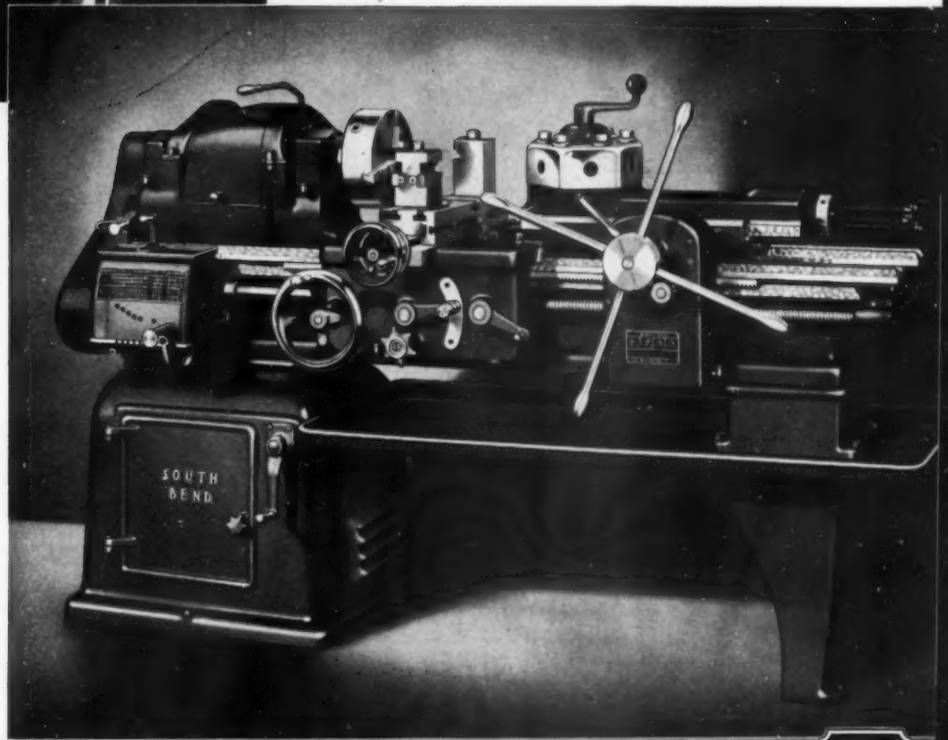
Modern in design, built with extreme precision, South Bend Turret Lathes are fast—accurate—versatile. They have the speed, power and rigidity for efficient quantity production of duplicate parts without sacrificing the precision accuracy or high quality finish usually considered possible only on small lots.

Features responsible for the outstanding performance of this new turret lathe include exceptionally rigid turret and carriage construction, a quick change gear box providing a wide range of power feeds for the universal carriage and the turret, complete thread cutting range through leadscrew and half-nut, and a wide range of spindle speeds.

SPECIFICATIONS

No. 2-H South Bend Turret Lathe

Hole through spindle	1 3/8"
Maximum collet capacity, round	1"
Swing over bed and saddle wings	16 1/4"
Spindle speeds, twelve	16 to 880 R.P.M.
Effective feed of turret slide	6 1/8"
Distance between spindle nose and turret	30 1/2"



E
FOR PRODUCTION
UNITED STATES
NAVY
BUREAU OF ORDNANCE
SOUTH BEND
LATHE WORKS

Navy "E" for Excellence

Awarded to the South Bend Lathe Works for outstanding performance in the production of ordnance materiél for the United States Navy.

SOUTH BEND LATHE WORKS

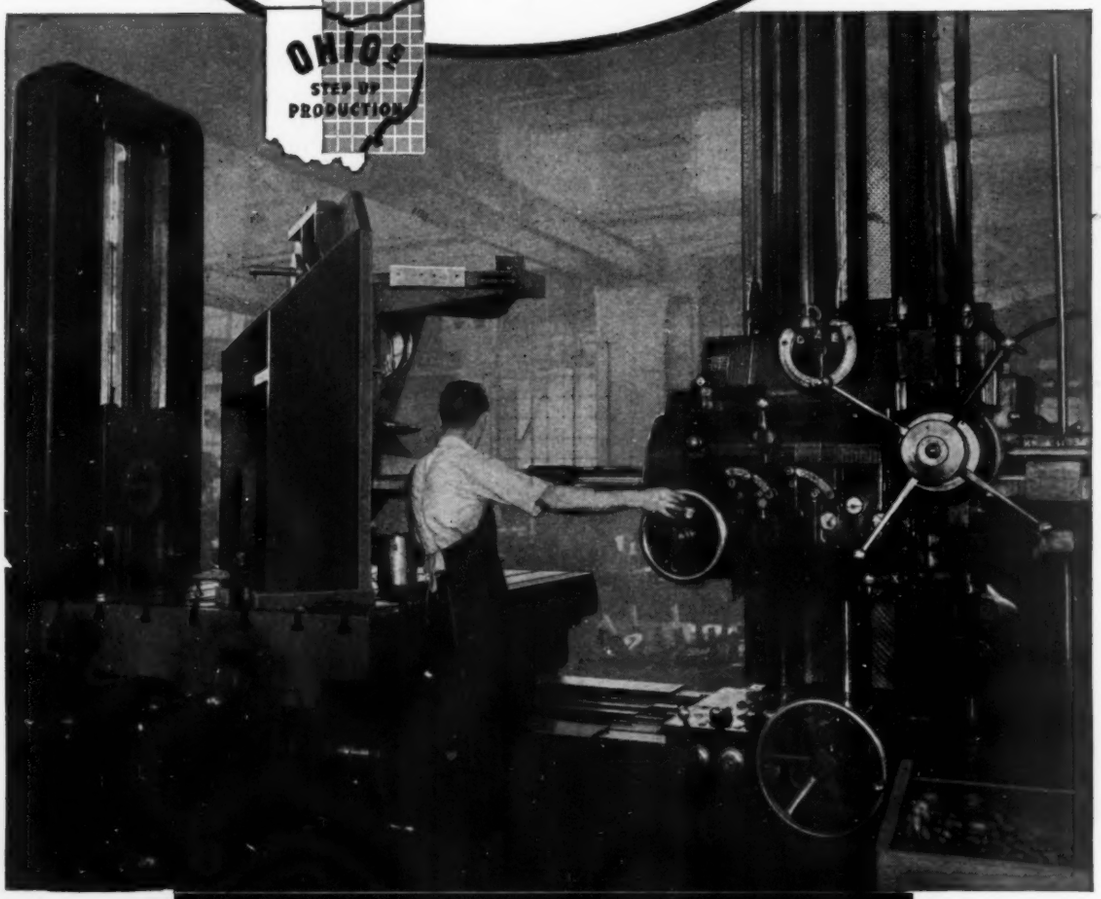
291 E. Madison St., South Bend, Ind., U. S. A. *Lathe Builders For 35 Years*

TRADE MARK SOUTH BEND ENGINE LATHES

OHIO HORIZONTAL

ON THE JOB!

BORING, DRILLING AND MILLING MACHINES



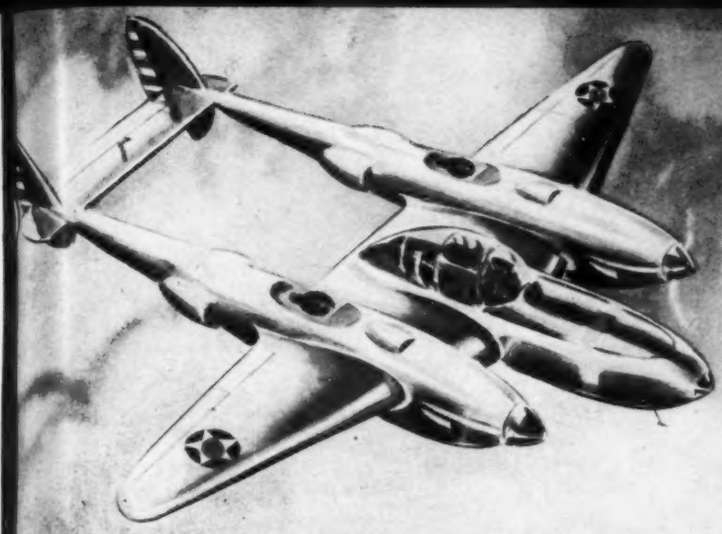
In the Holyoke, Mass. plant of the Worthington Pump & Machinery Corporation . . .

The Ohio Horizontal Boring, Drilling and Milling Machine has made a name for itself by fairly eating up the work *(power)*. The machine is widely known for its *precision*. It saves the operator's time and energy *(convenience)*. It frees him from the fear of accident *(safety)*. It stands up for many years *(long life)*.

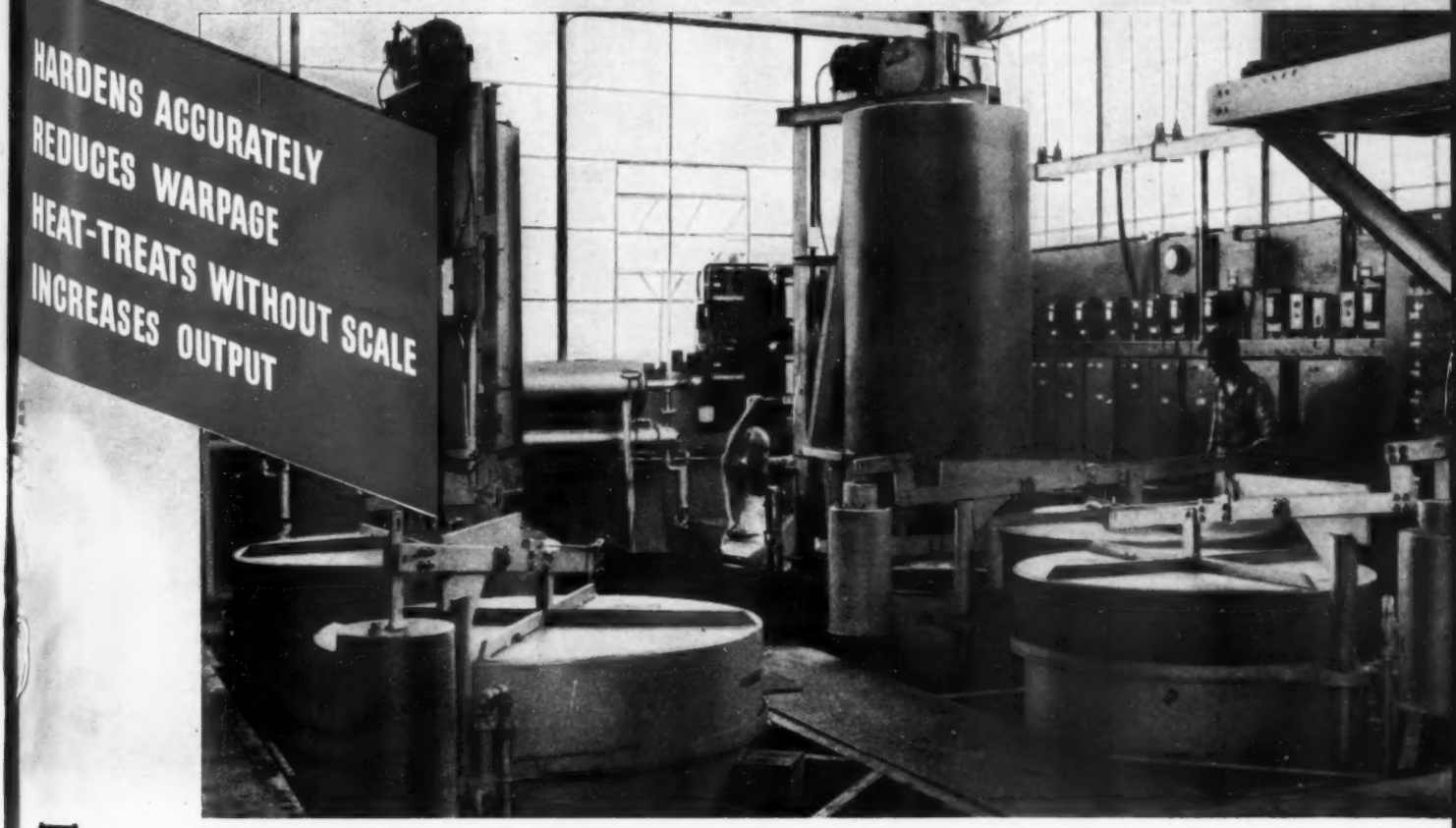
THE OHIO MACHINE TOOL COMPANY • KENTON, OHIO

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS



WHY Menasco Hardens Aircraft Parts in a G-E Pit Furnace



To give tubular parts for Lockheed interceptors the strength and elasticity to withstand the strains of battle requires uniform and accurate hardness of plus or minus one point Rockwell "C."

For such precise hardening—and it must be the most accurate possible—Menasco Manufacturing Company, of Burbank, Calif., installed two General Electric heat-treating units. Each consisted of a cylindrical pit and draw furnace, an oil-quench tank, standard atmosphere gas converter, and transfer hood. These furnaces did the required job so well that Menasco ordered another unit—even larger than the first two.

Warpage of long tubular parts is practically eliminated. Uniform and accurate hardness, assuring proper elasticity and toughness of parts, is obtained. Then, too, the parts come out of the furnace scale-free.

In addition, the furnace temperatures are controlled automatically. The gas combustion controller maintains unvarying flow of protective gas at any predetermined setting. As a result, time is saved—time so vital to today's war production.

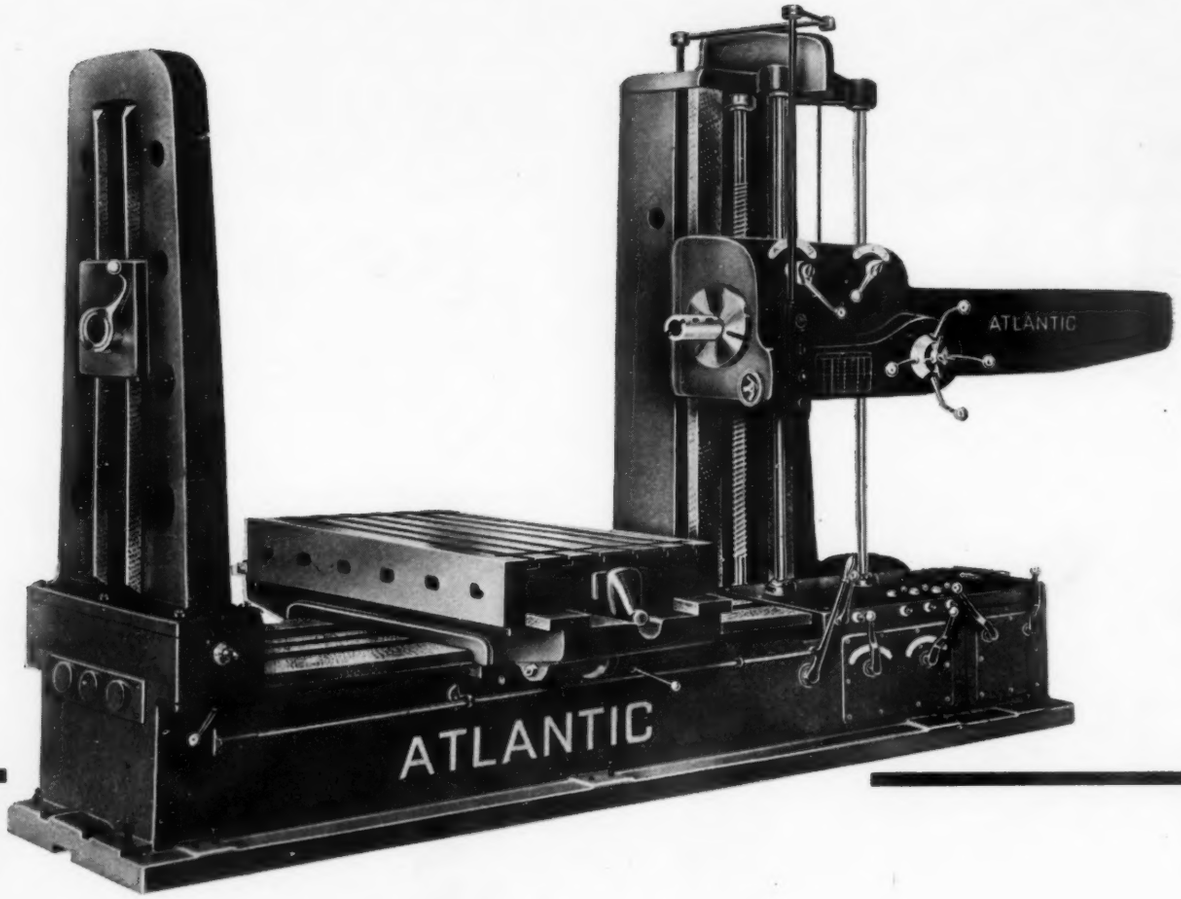
All this adds up to just one thing at Menasco—rapid production, of high and uniform quality, under comfortable working conditions. This installation is typical of what G-E engineers can do to help you solve your heating problems.

Your heating specialist in the nearest G-E office can show you dozens of tested and proved heat-treating equipments for practically every industrial need. Call him today, or write General Electric, Schenectady, N. Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

670-43-8188



3½"—4"—5" SPINDLE
HEAVY DUTY—PRECISION TYPE

HORIZONTAL BORING MACHINES

Designed for Accurate Work on Armor Plate, Armor Steel Castings and Similar Materials....

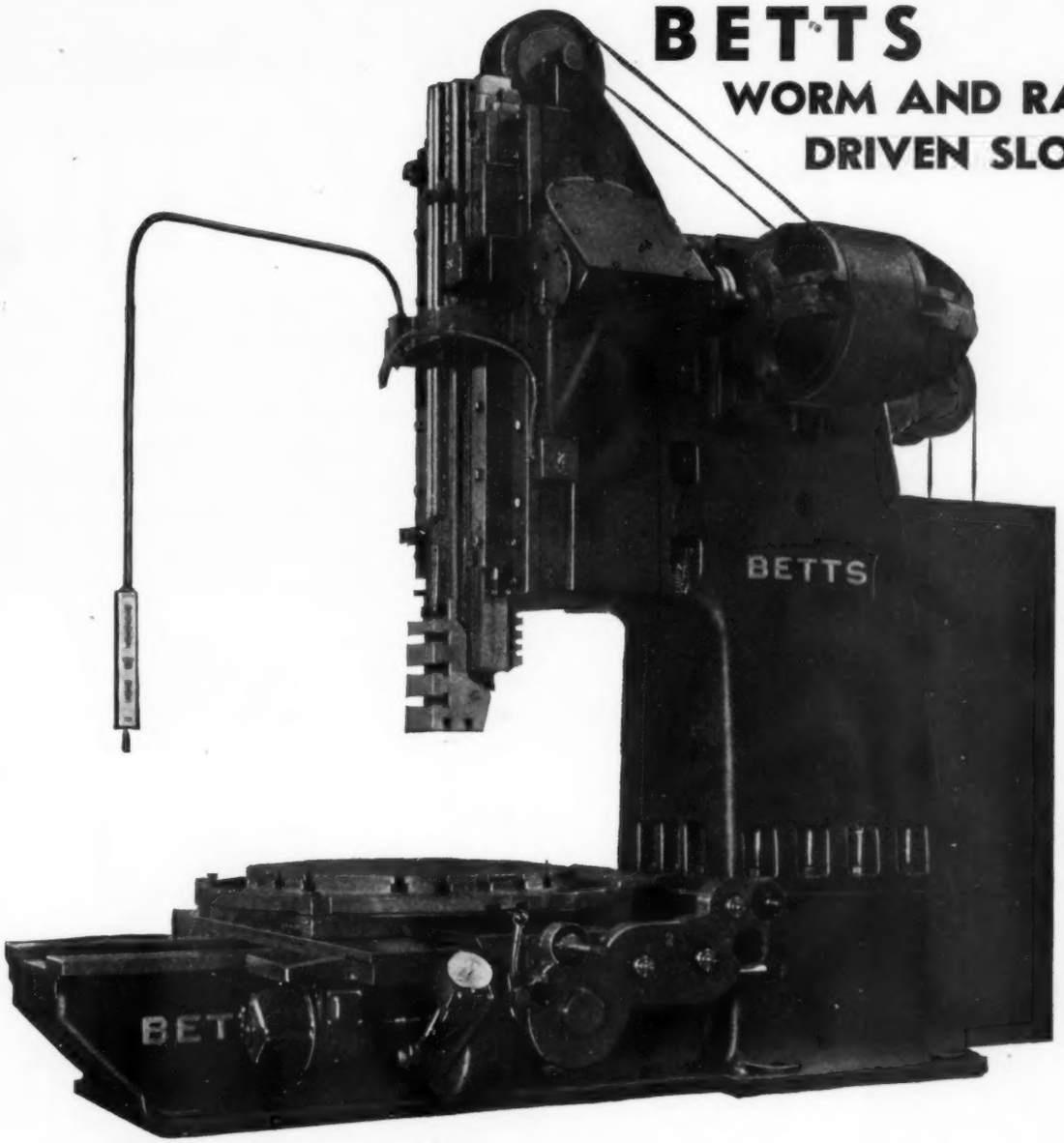
Reasonably Prompt Deliveries

ATLANTIC MACHINERY CORPORATION

149 BROADWAY **NEW YORK, N. Y.**

AMERICA'S BIG VICTORY PROGRAM NEEDS BIG MACHINE TOOLS LIKE THIS

BETTS
WORM AND RACK DRIVEN SLOTTER



BETTS Worm and Rack Driven Slotters are machines that are becoming increasingly valuable in our Victory Program. Here are machines that can do the long stroke slotting required on our armament material, accurately and quickly.

Strength and rigidity enable them to stand up under tough assignments and continuous service.

Expert design and workmanship make them handle easily.

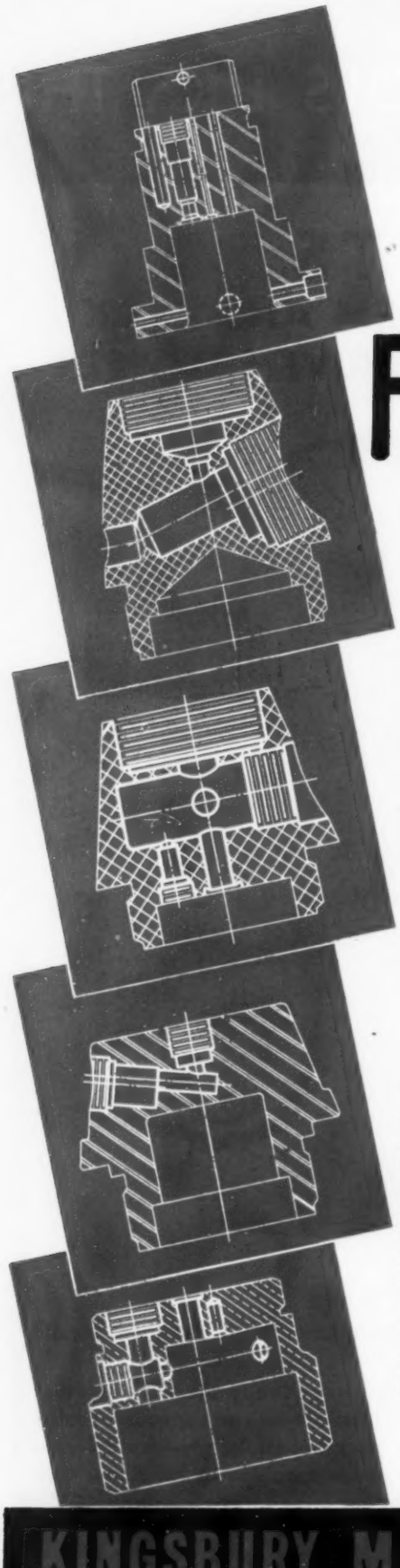
Pendant switch and conveniently placed levers that provide quick selection of feeds and speeds, of table adjustments, and length of stroke give the operator complete control of the machine at his finger tips.

Machine illustrated is rated at 48" stroke.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER, NEW YORK



Intricate Fuse Parts Produced with Minimum Number of Chuckings

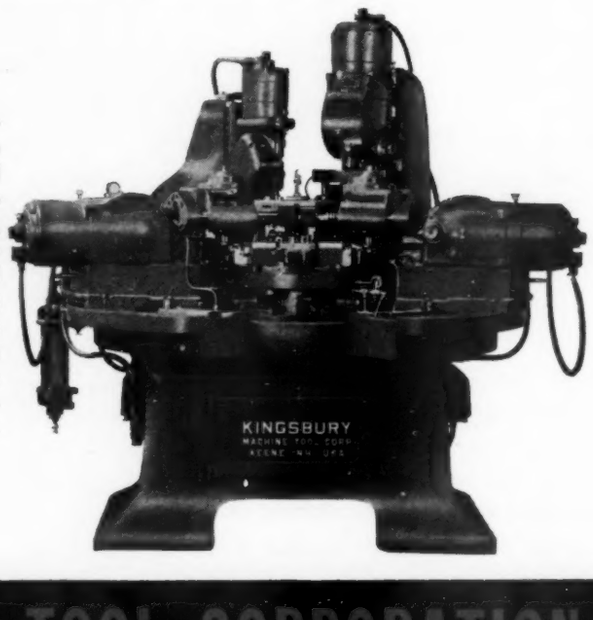
FLEXIMATIC

by KINGSBURY

The blanks for these shell fuse parts are taken from automatics and completed in from one to four handlings. Kingsbury FLEXIMATICS make it possible to perform in a single chucking a dozen or more highly intricate machining operations on fuse and rifle components and similar parts where speed and accuracy are essential to successful National Defense production.

Munitions production presents a three-fold problem . . . high standards of accuracy, pressing production demands and scarcity of skilled labor. Kingsbury FLEXIMATICS provide—in a single machine—the efficient means to solve all three phases of your defense production problems.

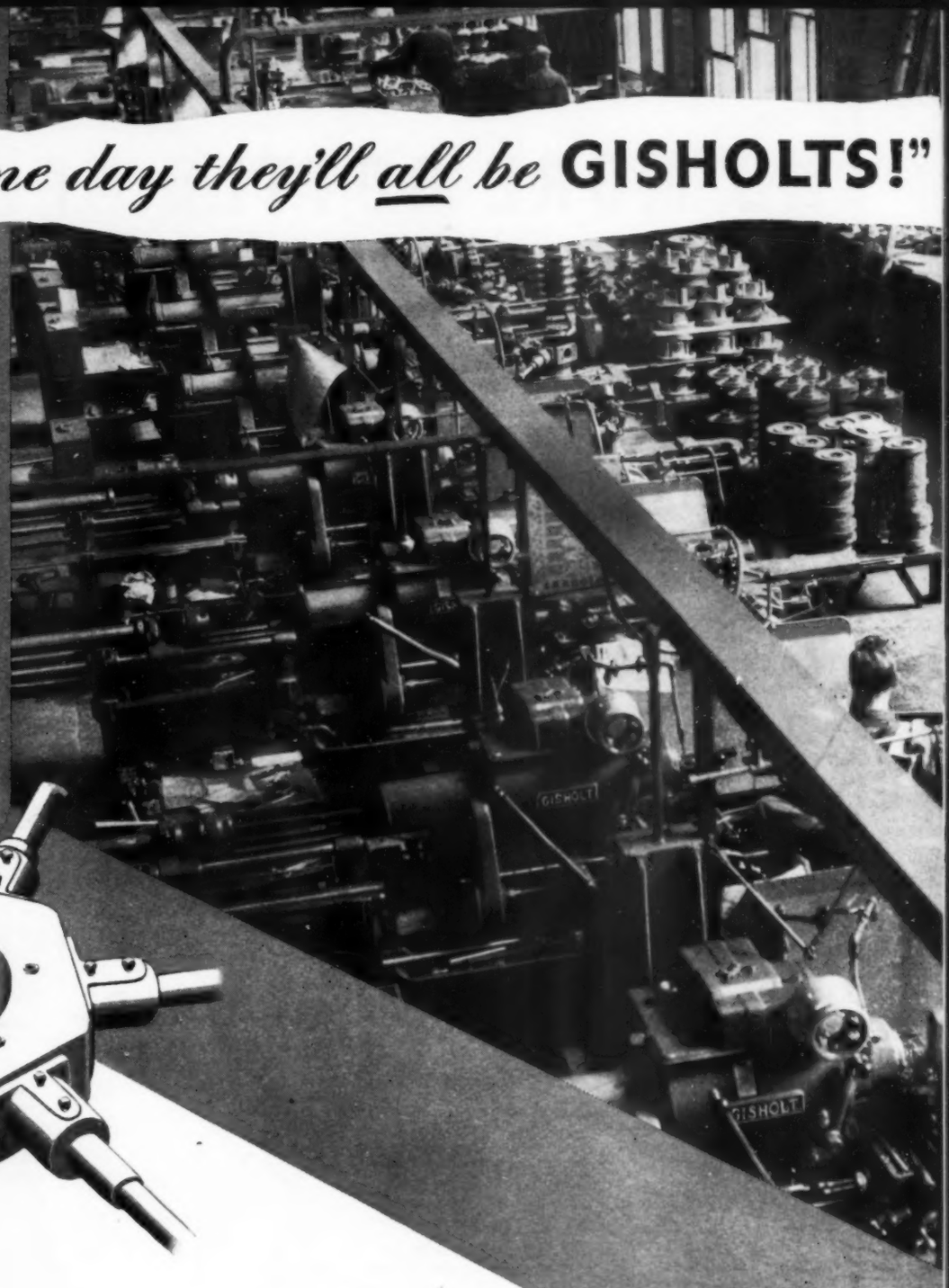
The FLEXIMATIC system of construction consists of Standard Units for drilling, tapping, boring, reaming, spot-facing, etc. Mounted on one of several standard bases. This unique method provides a flexible set-up which can be changed over to meet the machining requirements of many different parts.

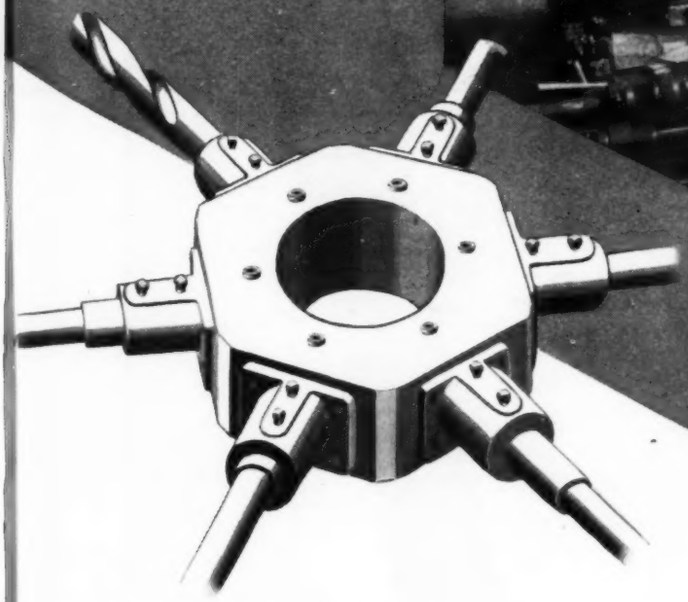


KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U.S.A.

"some day they'll all be GISHOLTS!"





YOU'LL hear it time and again as you get around the machine shops. You'll hear it from production men who've had experience with all kinds of machine tools—who know what it takes to make lower costs.

No wonder we like to put new Gisholts into plants where they haven't been used before. Before long, things begin to show up. Sometimes it's the ability to maintain precision at higher speeds, or to handle a wider variety of work. Again, it's the easier set-up, easier operation, or the freedom from maintenance costs. But whatever it is, the new Gisholts soon make friends with everyone—from operator to treasurer.

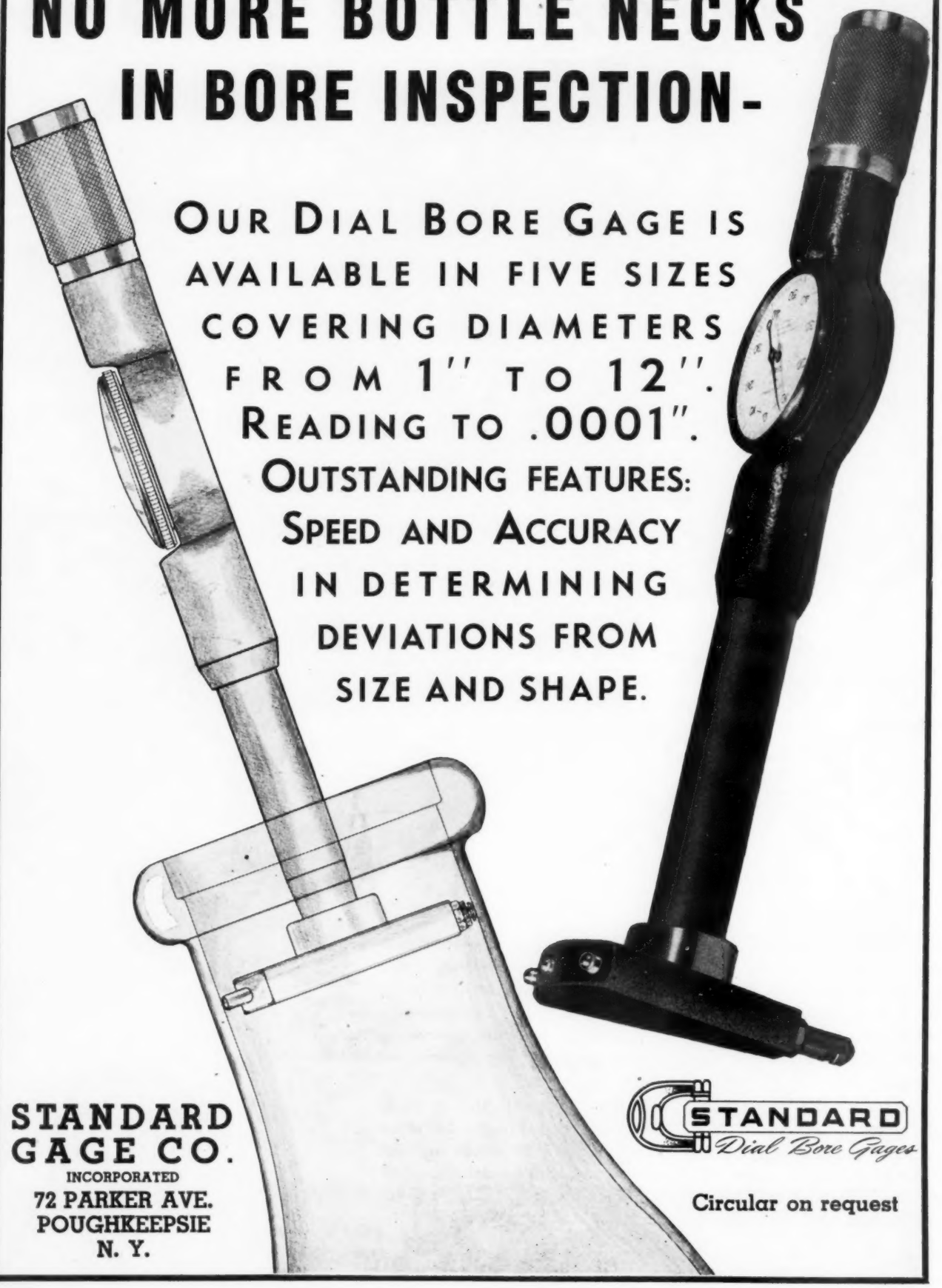
That's why you'll find so many men looking toward the day when they won't have to accept any substitute for Gisholt quality. Gisholt Machine Company, 1201 Washington Ave., Madison, Wisconsin.

GISHOLT

LOOK AHEAD—KEEP AHEAD—WITH GISHOLT IMPROVEMENTS IN METAL TURNING

★ TURRET LATHES ★ AUTOMATIC LATHES ★ BALANCING MACHINES ★

NO MORE BOTTLE NECKS IN BORE INSPECTION-



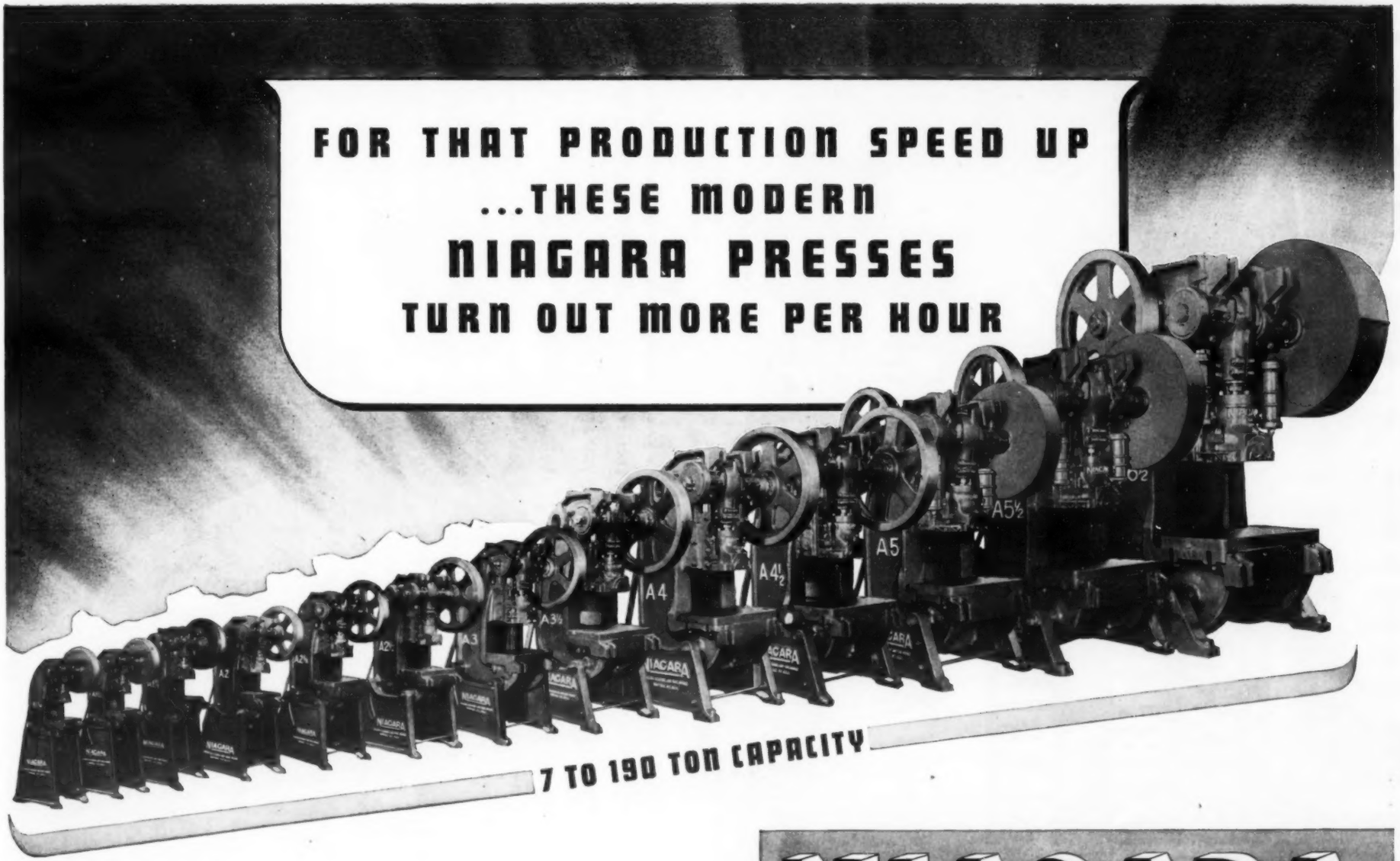
OUR DIAL BORE GAGE IS AVAILABLE IN FIVE SIZES COVERING DIAMETERS FROM 1" TO 12". READING TO .0001". OUTSTANDING FEATURES: SPEED AND ACCURACY IN DETERMINING DEVIATIONS FROM SIZE AND SHAPE.

STANDARD GAGE CO.
INCORPORATED
72 PARKER AVE.
POUGHKEEPSIE
N. Y.

STANDARD
Dial Bore Gages

Circular on request

FOR THAT PRODUCTION SPEED UP
...THESE MODERN
NIAGARA PRESSES
TURN OUT MORE PER HOUR



NIAGARA

NIAGARA MACHINE AND TOOL WORKS, BUFFALO, N. Y.

Branches: New York Cleveland Detroit

MANY TOOL ENGINEERS

Depend on

PRECISION FLEXIBILITY *and* VERSATILITY

To translate
ENGINEERING IDEAS INTO PRODUCTION FACTS

Double Barreled Advantage

A G&L CAN DO WORK ON A LOT OF PARTS AND CAN DO IT ACCURATELY

Tool engineers are being called upon today for the quick solution of many problems new to their particular industry because of national defense work.

Whether the solution to the problem is one requiring new jigs and fixtures—simple or complicated—close limits—small or large lot production of parts heretofore unusual — the G&L horizontal boring, drilling and milling machine is proving most valuable. If you are faced with the need for better quality and results, for greater speed, for increasing savings, for ways and means to aid labor, find out how a G&L will answer the need. There is a type and size best suited to your range of work.

A G&L gives you the right speeds, feeds, and power to do the greatest variety of jobs. A G&L gives you flexibility and accuracy to save time and trouble. A G&L gives you a fully modern method.

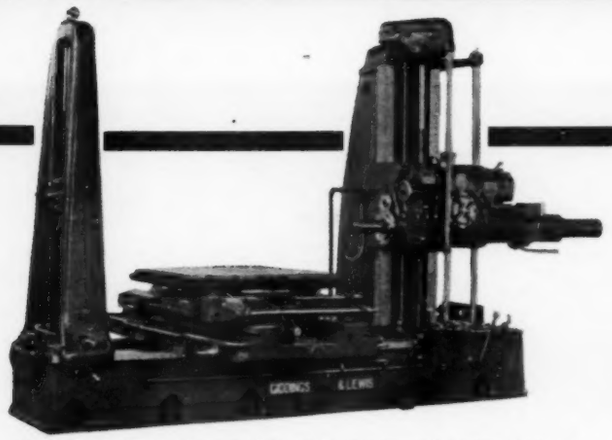
A G&L makes it possible to handle all work on one setting on most jobs—it is the kind of versatility you should have.

When you order a G&L you get a machine designed, not only to give you the most in speed and range of work, but because of its versatility and flexibility, one that will be of greatest value to you on the date it is placed in your service. We have added an addition to our plant, so that you can have all the benefits of the G&L method at the earliest possible moment. You play safe when ordering a G&L Many-Purpose Machine.

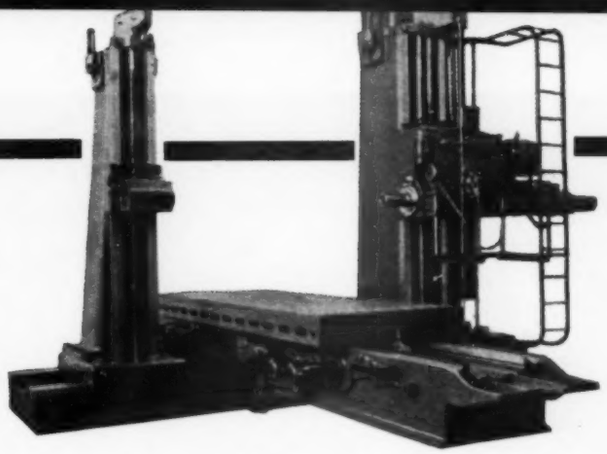
GIDDINGS & LEWIS
MACHINE TOOL CO.
Fond Du Lac, Wis.

HORIZONTAL
BORING - DRILLING - MILLING MACHINES

THE MORE G & L USERS ------

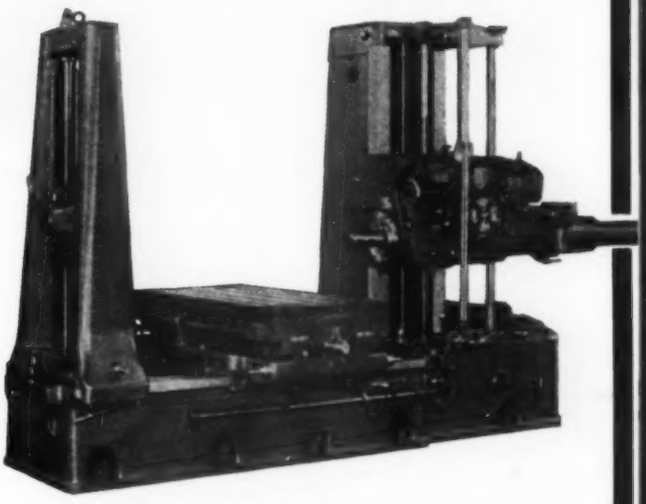


★ 340-RT: (4" main spindle), G&L Horizontal Boring, Drilling and Milling Machine with built-in 48" diameter power revolving table

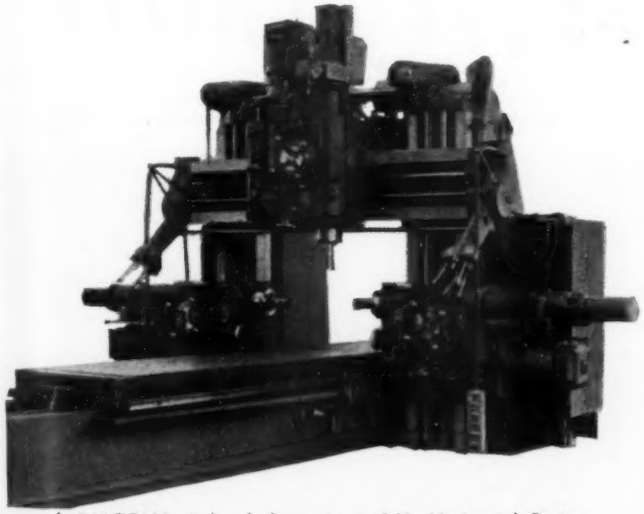


★ 360-P: (6" main spindle) Planer Type, G&L Horizontal Boring, Drilling and Milling Machine

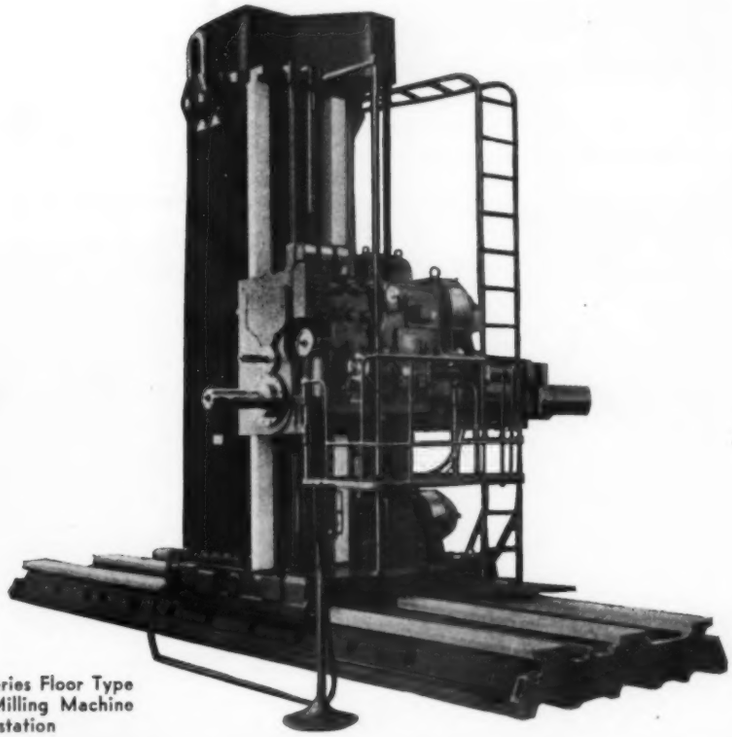
Send us your prints of castings or tell us the kind of work you have and we shall be glad to outline the possibilities of one of our machines on your type of work. Descriptive bulletins, covering every type of G&L Horizontal Boring, Drilling and Milling Machine, engineering recommendations, and G&L service are offered to manufacturing executives. If you wish, G&L representatives will gladly call and give you all of the facts on the G&L Method.



★ 340-T: (4" main spindle) Table Type G&L Horizontal Boring, Drilling and Milling Machine



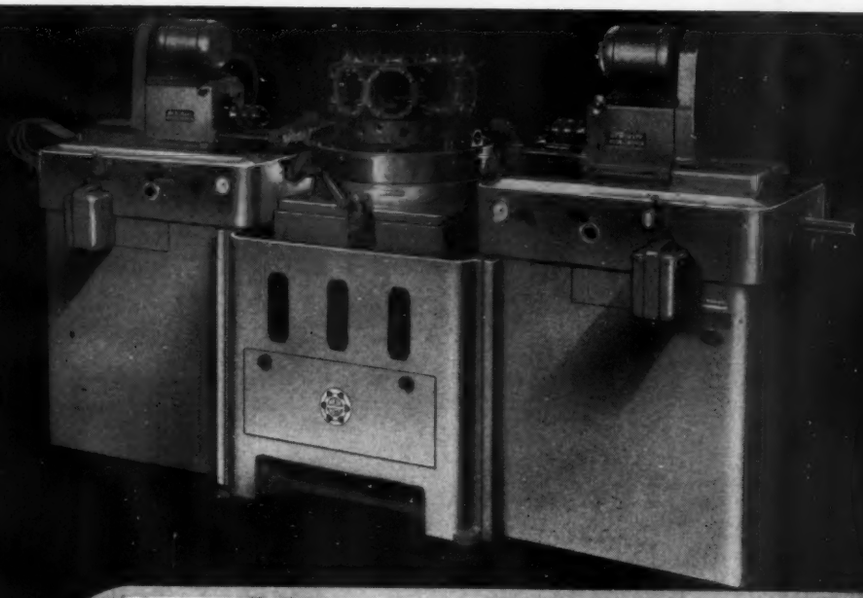
★ 340-PQ3H: 3 head-planer type G&L Horizontal Boring, Drilling and Milling Machine



★ 560-F: (6" main spindle) new 50 series Floor Type G&L Horizontal Boring, Drilling and Milling Machine with portable remote control station

THE MORE G & L BOOSTERS

Honing valve guides after assembly in crankcase (Radial Aircraft Engine) on Double End Hydrohoner with Micr-O-Size control—production 3 to 6 complete assemblies per hour—removes average of .0005" to .001" stock per bore—generates uniform size within .0003" to .0005", accuracy within .0001" to .0003" and surface finish within 3 to 5 micro-inches, r.m.s.



AIRCRAFT···—

AIRCRAFT···—

Feathering Oil Pump Gear Teeth (Aircraft Engine) external honing.

FOR VICTORY PRODUCTION

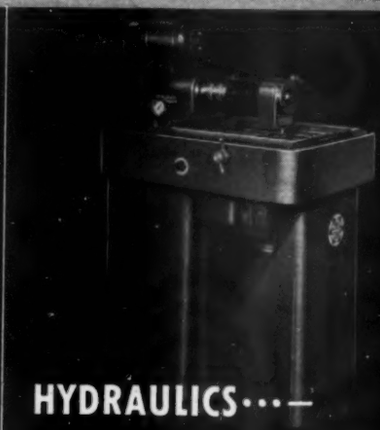
SAVE TIME ★ SAVE METAL ★ SAVE COST ★ IMPROVE QUALITY ★

AIRCRAFT···—

Honing Piston Pin Bores (Aircraft Engine).

AIRCRAFT···—

Honing Valve Guides (Aircraft Engine) before assembly.



HYDRAULICS···—

Honing O.D. of pistons for a variable delivery pump.

Honing cast iron valve guides on full automatic Hydrohoner with Micr-O-Size control—Production 250 pieces per hour. Average Stock removed, .0015" to .0025"—Size within .0005" tolerance; accuracy within .0001" to .0002"; surface finish within 3 to 5 microinches, r.m.s.

Honing Piston Pin holes (in Piston) on Double Spindle Hydrohoner with Micr-O-Size control.

AUTOMOTIVE···—

Microhoning has been adopted in most armament production shops to speed up the final processing operation on vital bearing surfaces.

Microhoning generates final surfaces with the minimum amount of stock removal.

Microhoning saves sufficient processing time and cost in some installations, it is reported—even *to pay for the machine in 30 to 40 operating days.*

Microhoning controls cutting pressure, speed and motion to produce maximum obtainable quality of generated surfaces.

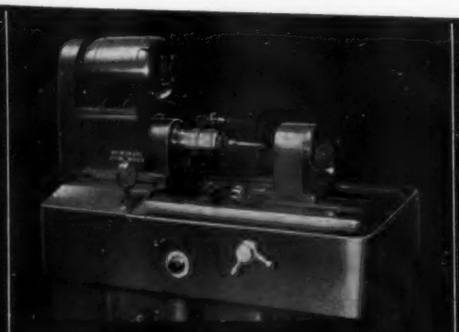
Write for Bulletins AR60 and AR64 for further details.

MICROMATIC HONE CORPORATION

1345 E. MILWAUKEE AVE. DETROIT, MICHIGAN

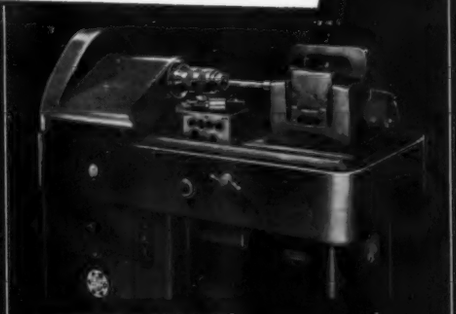
ORDNANCE···—

Double Spindle Hydrohoner with Micr-O-Size control for honing gun charger tube bores.



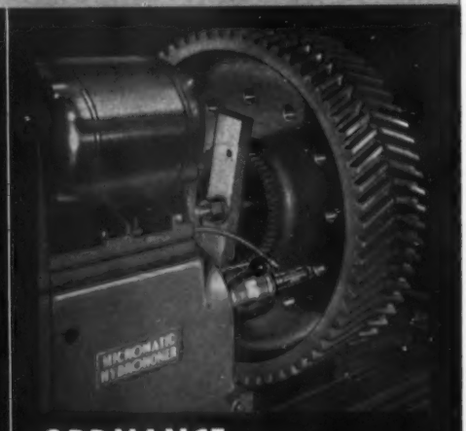
HYDRAULICS···—

Honing blind end bores in a variable delivery pump body.



HYDRAULICS···—

Honing bores in hydraulic valve body on Micromatic Hydrohoner.



ORDNANCE···—

Honing pinion shaft bores in hardened planetary gear for military vehicle.

84 Tapping Operations on the Three Faces of 10 Crankcase Sections per Hour

The two NATCO HOLETAPPERS shown above are being used by an aircraft engine manufacturer for tapping a total of 84 holes on the 3 faces of the upper crankcase section also shown. Production is 10 parts per hour. The first machine is a Vertical NATCO HOLETAPPER complete with a head containing 56 individual lead screw tapping spindles. The part is held in a stationary type fixture while 56 tapping operations are performed.

The second machine is arranged with a tapping head containing 14 individual lead screw spindles. Head is arranged with a hydraulic traverse. The crankcase section is held in a 2-position rotating fixture. The holes are tapped in one angular face, fixture is indexed 180°, and the holes are then tapped in the other angular face. A total of 28 holes are tapped with one handling of the part. Production is 10 parts per hour.

NATCO HOLETAPPERS are semi-automatic in operation, are provided with ground individual lead screw spindles, and may be used for tapping large or small, coarse or fine, straight or taper threads simultaneously. This is accomplished by making the lead of the ground screw identical to the lead of each tap.

NATCO HOLETAPPERS are successfully tapping steel, cast iron, aluminum, bakelite, and bronze. Write for literature or call a NATCO representative. He will gladly assist your engineers in reducing your tapping costs.

NATCO Advanced Engineering
Plus Quality Construction
Recognized For Many Years
The World Over

THE NATIONAL AUTOMATIC TOOL COMPANY
Richmond, Indiana, U. S. A.

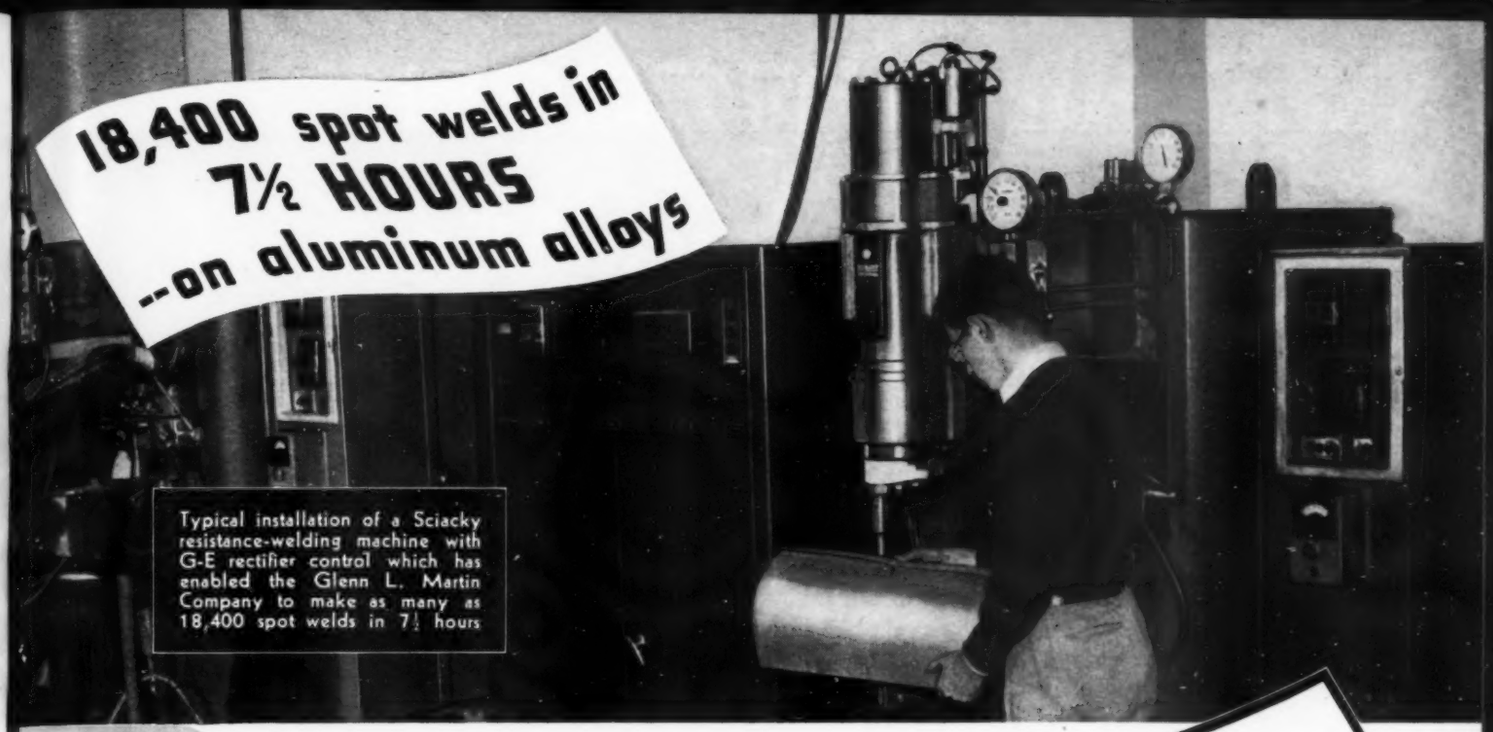
Chicago Office: 1809 Engineering Building
Detroit Office: 409 New Center Building

Investigate NATCO Methods for the Lowest Possible Hole Costs!

NATCO

DRILLING, BORING and TAPPING MACHINES

SOLVES YOUR "HOLE" PROBLEM



18,400 spot welds in 7½ HOURS --on aluminum alloys

Typical installation of a Sciacky resistance-welding machine with G-E rectifier control which has enabled the Glenn L. Martin Company to make as many as 18,400 spot welds in 7½ hours

GET CONSISTENT, HIGH PRODUCTION WITH G-E IGNITRON RECTIFIERS

on inductive-type stored-energy welding

PROVED by more than 18 months of actual use in supplying power to inductive-type, stored-energy welding machines, G-E ignitron rectifiers are helping users get fast, dependable operation—particularly in the aircraft industry.

Because of its low kva demand, the inductive type of stored-energy resistance welding permits the use of low-cost plant distribution systems and reduces voltage drop. It also permits installation of welding machines at the most favorable point in the production line—even though this may be at some distance from the distribution transformers.

Good voltage regulation afforded by the low kva demand also reduces the possibility of light flicker and limits interference with other welding equipment on the same circuit.

Designed by outstanding electronics engineers, these G-E rectifiers are built for ease of installation and low maintenance. Whatever your problems on control for resistance welding — consult your nearest G-E office. Our control specialist will be glad to work with you. *General Electric, Schenectady, N. Y.*

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC

DELIVERY NEXT MONTH!

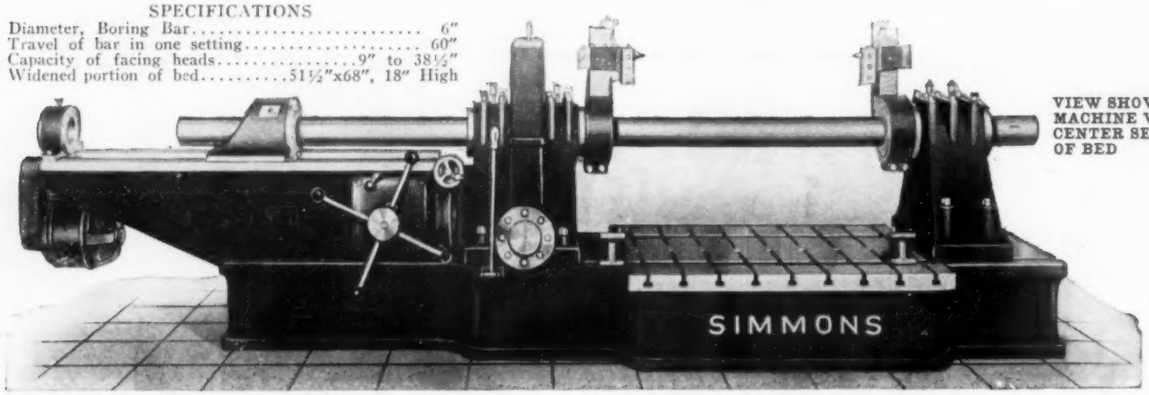
6" BAR HORIZONTAL BORING and FACING MACHINE

The new Simmons 6" Bar Horizontal Cylinder Boring and Facing Machine is the ideal machine for current War Production requirements. The bed is of massive construction and heavily ribbed to insure maintained alignment. Machine is available with or without center section of bed.

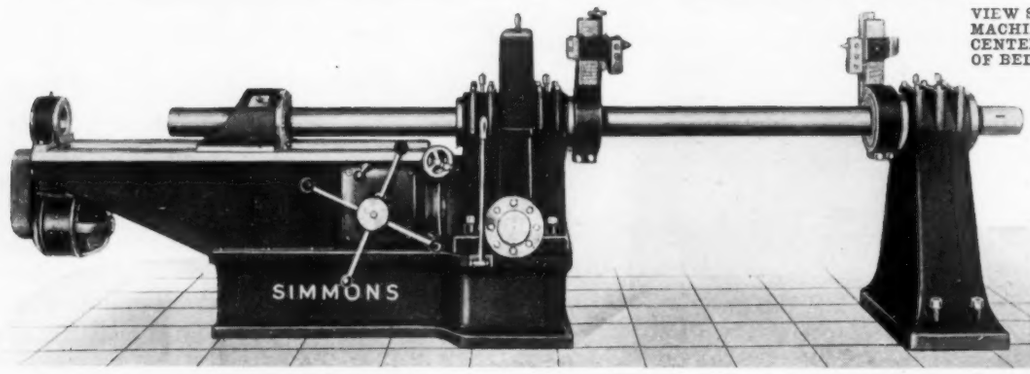
Equipped with Simmons Micro-Feed Unit, an infinitely variable transmission, this boring machine offers both fine and coarse feeds ranging from .004" to 1.000" per revolution of spindle. The main drive to the boring bar is obtained through a six-speed gear box, motor-driven. Gears are of high-carbon steel and mounted on spline shafts with anti-friction bearings running in oil. Power Rapid Traverse to bar in both directions.

SPECIFICATIONS

Diameter, Boring Bar..... 6"
Travel of bar in one setting..... 60"
Capacity of facing heads.....9" to 38½"
Widened portion of bed.....51½"x68", 18" High



VIEW SHOWS MACHINE WITH CENTER SECTION OF BED



VIEW SHOWS MACHINE WITHOUT CENTER SECTION OF BED

*Write **TODAY** for Descriptive Bulletin*

SIMMONS MACHINE TOOL CORP.

1759 North Broadway, Albany, N. Y.

New York Office: 149 Broadway

SIMMONS

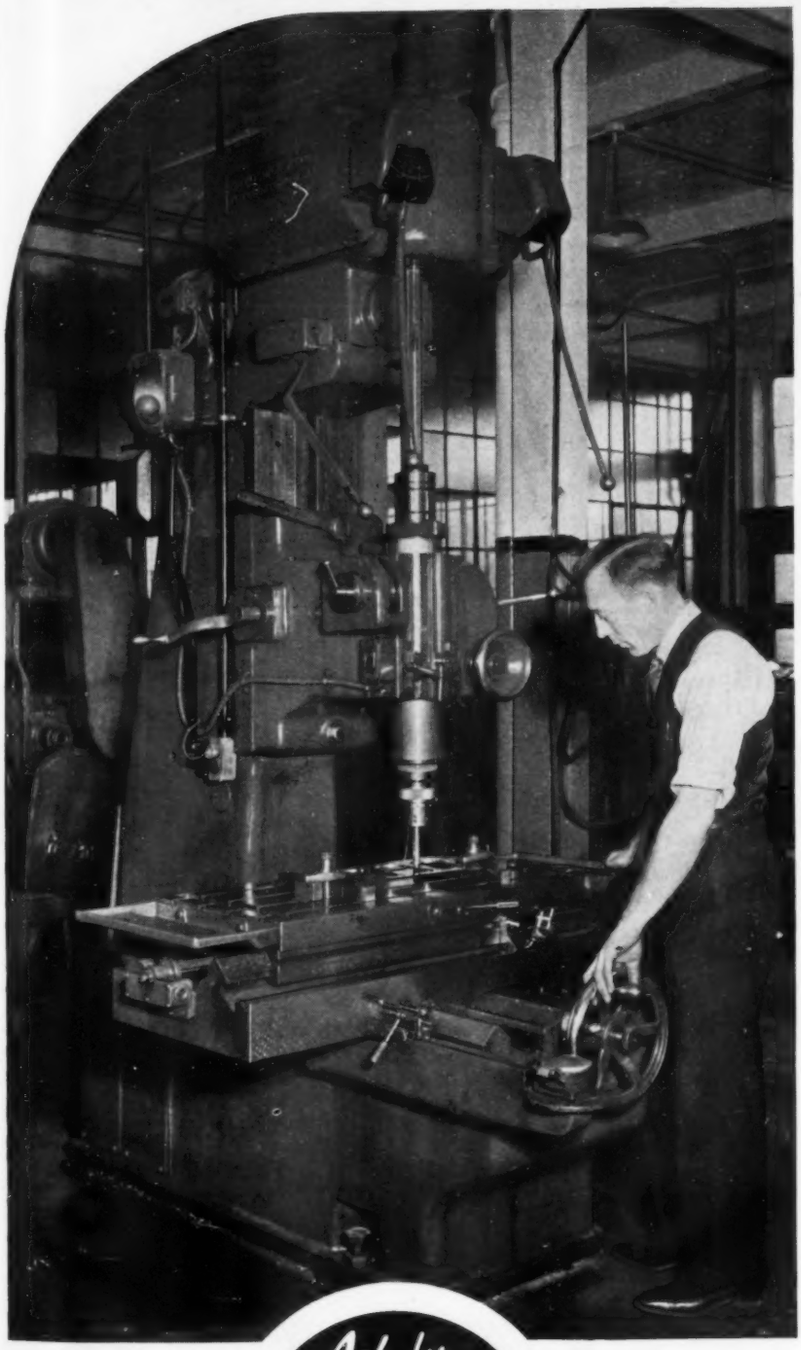
MICRO-SPEED

REG. U.S. PAT. OFF.

LATHES · TURRET LATHES · MILLERS · BORING MACHINES

FOR INCREASED PRODUCTION

FOSDICK *Jig Borers*



• Here's a sturdy, easily operated machine adaptable to a wide range of drilling, boring, facing and similar operations on all kinds of work.

It is ideal for the tool room where extreme accuracy is required on different types of work. Also is used on production jobs for duplicate operations where jigs and fixtures are not economical.

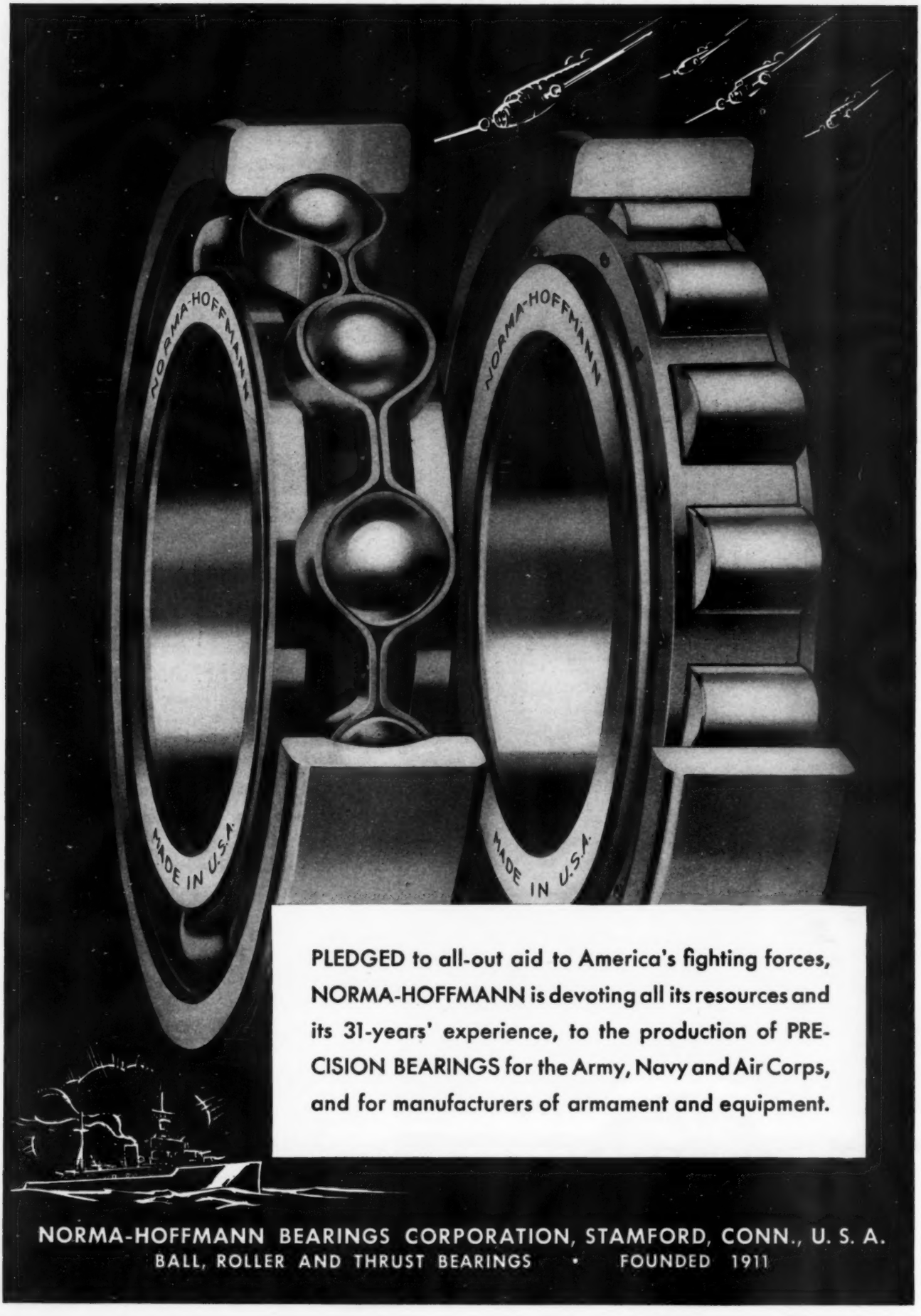
It is shown here in a mid-western tool shop performing a boring operation on war work. The flexibility and ease of control provides low costs and comparatively high production for a machine of such universal application.

Ask for Jig Borer Bulletin J.B.A. for specific information

Built in two sizes the 30 and 30-A

Ask for JIG BORER BULLETIN J.B.A *for Specific Information*

FOSDICK MACHINE TOOL COMPANY
CINCINNATI · · · OHIO



PLEDGED to all-out aid to America's fighting forces, NORMA-HOFFMANN is devoting all its resources and its 31-years' experience, to the production of PRECISION BEARINGS for the Army, Navy and Air Corps, and for manufacturers of armament and equipment.

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN., U. S. A.
BALL, ROLLER AND THRUST BEARINGS • FOUNDED 1911

BIG OR LITTLE

LANDIS GRINDS THEM FAST

Both races illustrated are used in the manufacture of aircraft. That means production is of vital importance. One measures 7⅛" in diameter, while the other measures only ⅜". However, this presents no problem because by using the Landis No. 1 and Landis No. 2 Race-A-Way Grinders, these, and the many sizes of races in between can be productively ground.

One manufacturer uses Landis No. 1 Race-A-Ways for grinding the inner raceways of No. 203 outer races. Production averages 250 pieces per hour per operator. Another manufacturer uses Landis No. 2 Race-A-Ways for grinding the inner raceways of No. 207 outer races. Each machine grinds an average of 103 races every hour with one man operating two machines.

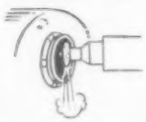
When you consider that in most cases one operator can handle two machines, you can understand why Landis equipment means added production, whether your races be large or small.

Unusual Performance
As Usual

PRECISION LANDIS GRINDERS

LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA.

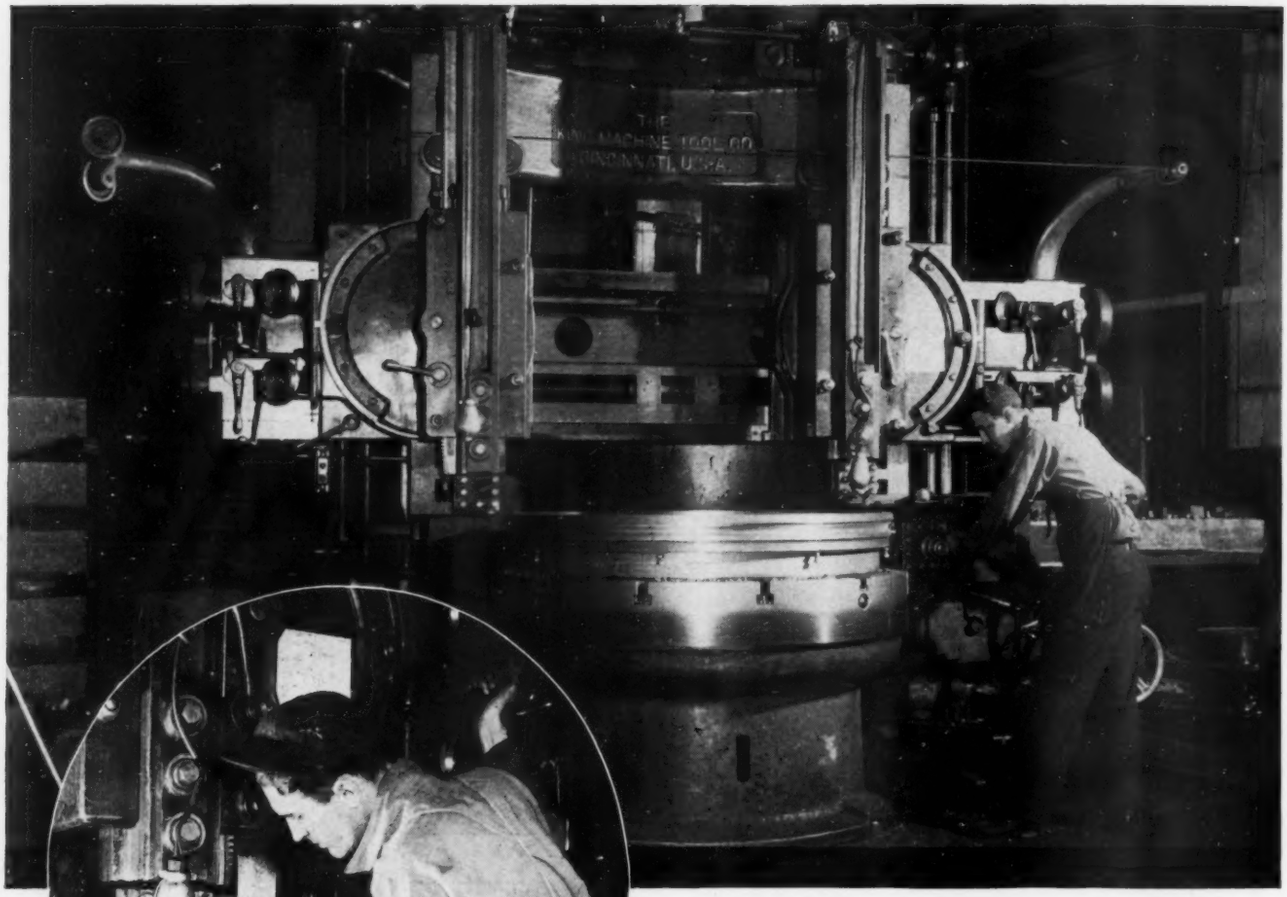
AUTOMATIC GRINDING CYCLE



SPINDLE SPEEDS UP TO 50,000 R.P.M.

AUTOMATIC WHEEL RESET

389



KING

Rough and Finish Turns Steel Rings at One Setting for Goodyear

• This King Vertical Boring & Turning Machine rough and finish turns this 57" O.D. steel ring complete in 8 hours. The ring is 3½" thick—material S.A.E. 4140 Steel. The cutting tool made from a special molybdenum steel is capable of high speeds and heavy feeds.

Briefly this illustrates the power —accuracy and all around utility of King Boring and Turning Machines. Your work may not be as large or it may entail other operations but if it can be done on a Vertical Boring and Turning Machine you'll make no mistake with KING.

BUILDS

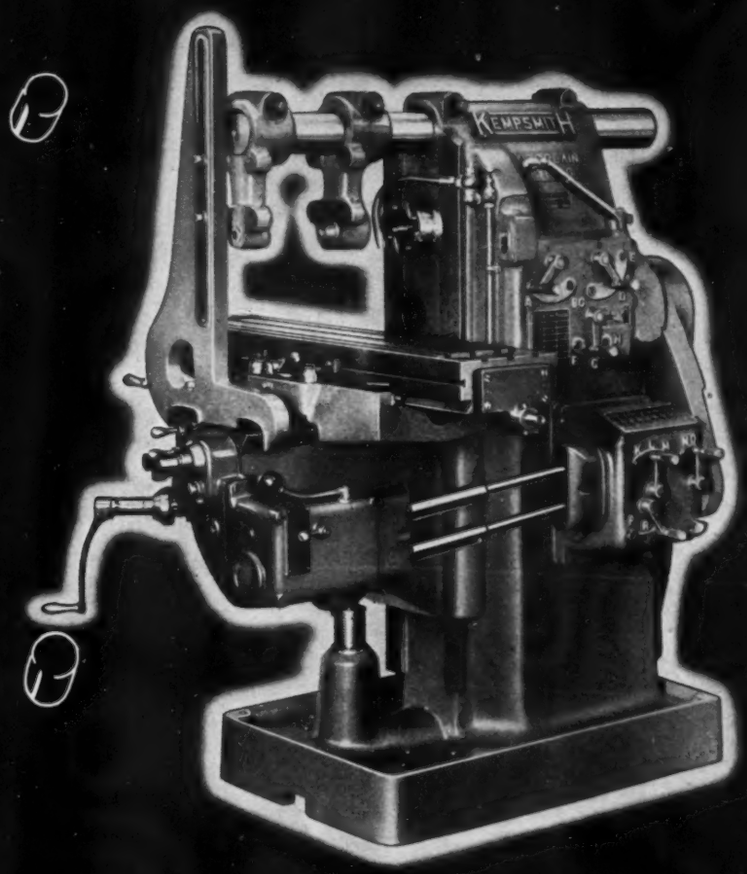
King Vertical Boring and Turning Machines are built in single column types from 30" to 42" and double column types up to 10 feet.

CONTRACT SHOPS. We are interested in shops capable of producing complete sub-assemblies for Boring Mills from 52" to 10 ft. swing. When writing state facilities and what subassembly work could be handled.

The KING MACHINE TOOL Company

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

CINCINNATI, OHIO



Precision **PLUS** *Economy* **FROM THE LATEST PAGES OF THE 54-YEAR HISTORY OF KEMPSMITH MILLING MACHINES**

KEMPSMITH TYPE "G" MILLER

For Tool Room and general production use,

the Type "G" KEMPSMITH All-Geared Unit (Plain or Universal) has proved by performance under strenuous Defense demands, that it is a worthy member of the KEMPSMITH family of reputable milling machines . . . with Centralized control, 18 speeds and feeds (ball-bearing speed, feed and spindle assemblies), Knee Gib, Unit Construction, Motor-in-Base . . . also available with power rapid traverse at additional cost . . . economical in first cost, precise, and efficient —

. . . a "brother" of the famous KEMPSMITH MAXIMILLER!

PRECISION

MILLING MACHINERY

Experience SINCE 1883

KEMPSMITH MACHINE CO.

MILWAUKEE • WISCONSIN

ANNOUNCING!

the greatest Motor Improvement in years!

New Design . . . New Construction Give You New Protection You've Never Had Before In A General Purpose Motor!

OUTSIDE . . . INSIDE . . . from bearing to bearing . . . from frame to shaft—Allis-Chalmers now gives you a NEW motor more completely protected — more able to stand the terrific abuse today's production schedules demand.

All the experience of building motors for over fifty years has been concentrated in the development of this advanced product. Specially designed to give your motors "all-around" protection, the new "Safety-Circle" is a wide, solid rib — integrally

cast a
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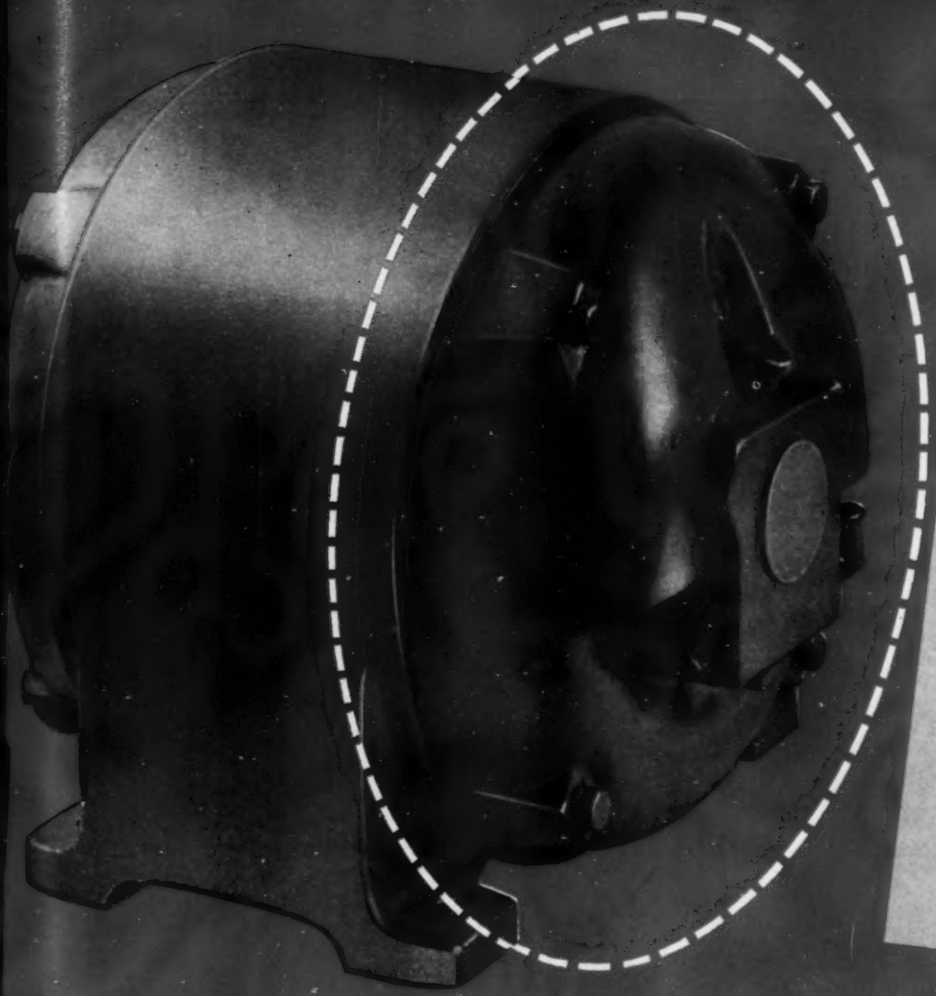
ALLIS-CHALMERS LO-MAINTENANCE M



SEE HOW "Safety Circle" GIVES YOU PROTECTED ENCLOSURE OF ALL VITAL PARTS

Look at the "broken-circle" design of other motors with exposed undercarriage and incomplete protection. Compare this to "Safety-Circle" construction that guarantees *all-around protection* of vital parts.

Acting as an anchored shock absorber, it gives the entire structure of the motor and all its parts high resistance to blows, knocks, falling objects — keeps your motor in factory-fresh condition for its entire life under normal operating conditions.

To foremen, superintendents, and maintenance men it means more service and smoother operation with less maintenance and lower costs — *more motor for your money* in the Allis-Chalmers way.

NEW ALLIS-CHALMERS LO-MAINTENANCE MOTOR WITH ALL-AROUND "Safety Circle" PROTECTION*

cast as part of the frame — which forms an unbroken circle of protection around the stator. One-piece cast frame and cast end-brackets guard against exterior knocks and abuse.

A more liberal use of electrical materials makes this motor internally and electrically stronger because current and magnetic densities are less extreme. Additional cross strength has been built into the distortionless stator. Rotor is keyed to the shaft for strength, and its outer surface is turned to assure air-gap accuracy and uniformity.

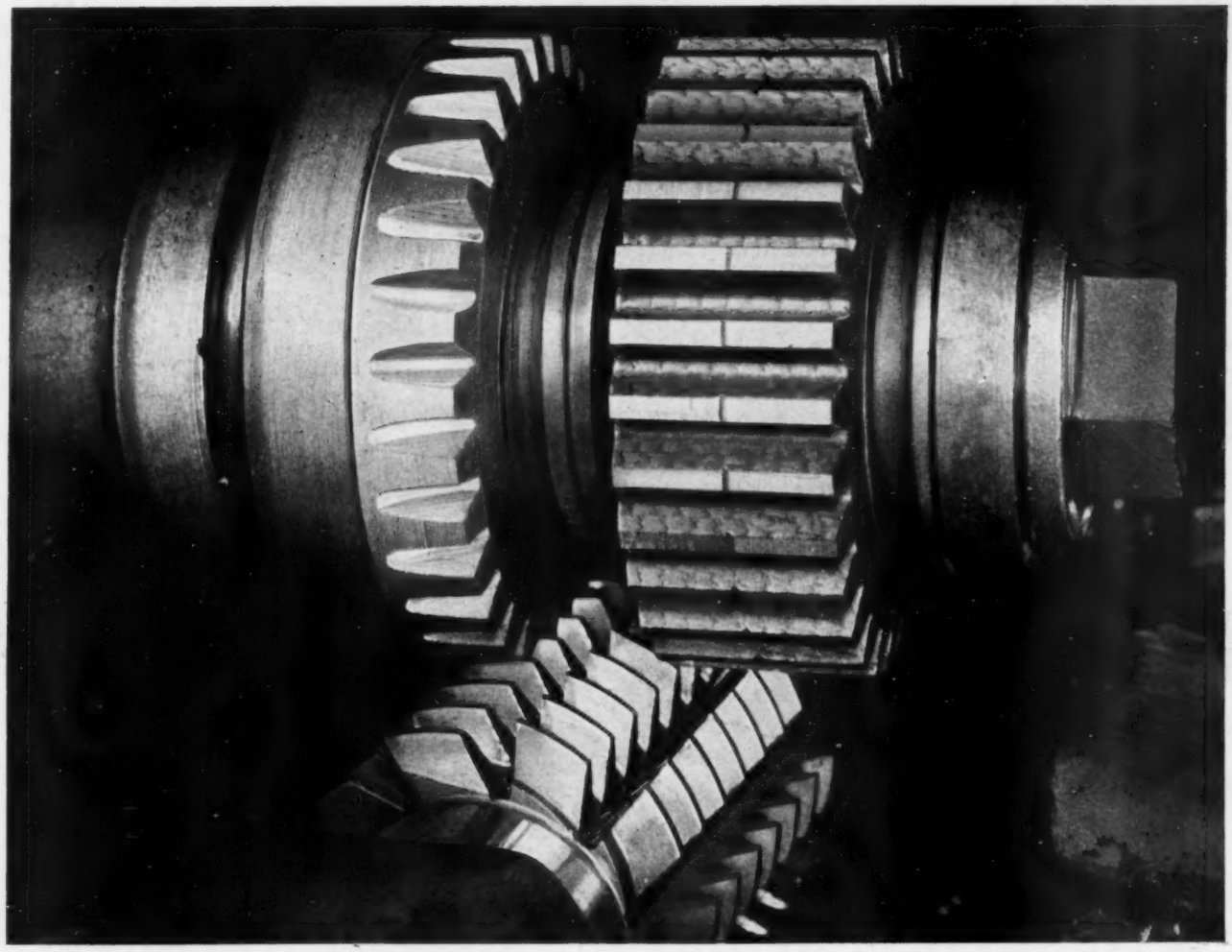
Shorter, stronger bearing design delivers smooth performance with full-flow lubrication and easier maintenance. New machining and production methods make all parts uniform and interchangeable.

Other Lo-Maintenance features of this outstanding NEW Motor are oil drains at the bottom of the bearing box for easy flushing, removable end-brackets and large conduit box for handy wiring.

Write Allis-Chalmers, Milwaukee, Wisconsin, for Bulletin No. B-6210, and test this NEW Motor's design and construction against your own experience! See how it fits your needs . . . then call the engineer in the district office near you!

*Don't confuse this NEW motor with higher-priced motors for so-called special purposes. All the extra advantages of this standard motor are yours *at no extra cost!* A 1484

E MOTOR WITH "Safety Circle" PROTECTION



Like a Beaver Going Through a Sapling...

The beaver is one of nature's fastest and cleverest workmen, and uses his highly developed incisors as exceptionally efficient cutting tools.

DATA ON THIS JOB

Part — High and third speed tractor transmission gear.

Material — SAE 5145 steel, 43-48 carbon.

Outside Diameter — 4.414".

Depth of Cut — .321".

Holding Means — On arbor between centers.

Hob — B-C *Hi*-Production 3" dia., 3½" long, 1¼" hole, double thread, unground.

Machine — G & E No. 12.

Production — See text.

NATURE designed the beaver's teeth for extra strength and fast cutting . . . Barber-Colman engineers designed the special teeth of B-C *Hi*-Production Hobs with similar ideas in mind. The amazing speed and efficiency of the beaver cutting up a sapling for his dam is paralleled by the extraordinary cutting power of these B-C Hobs on production roughing jobs.

B-C *Hi*-PRODUCTION HOBS ROUGH 28 TRANSMISSION GEARS AN HOUR

Four tractor transmission gears, over 4" diameter and with ¾" face, 29 teeth, 7 pitch, are loaded in facing pairs as shown. With a hob speed of 140 r.p.m. and a feed of .080" per revolution of work, cutting time for the load is only 5.2 min. Net production, allowing for loading time, hob changes, and operator efficiency, is 28 pieces per hour. Accuracy calls for .005" maximum runout on root diameter and .015" stock on the teeth for finishing. The hobs give 5 settings, 32 pieces per setting, and 160 pieces per grind.

SPECIAL TOOTH DESIGN GIVES GREATER CUTTING POWER

B-C *Hi*-Production Hobs have special teeth, designed for higher cutting efficiency, greater cutting clearance, longer life, and distribution of wear over a larger surface. This is accomplished by reducing the pressure angle, which increases the tooth surface at the tops of the teeth, by increasing the clearance on the leading sides of the teeth, and by using straight gashes and a positive rake for a shearing cut. Tests in comparison with conventional hobs show 10% to 50% greater production per unit of working time, and from 10% to 25% less power consumed.

***Hi*-PRODUCTION HOB**

Usually made with double lead. When you ask for a quotation, be sure to specify the number of teeth in the gear to be hobbed.

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 201 Loomis Street, Rockford, Illinois, U. S. A.

DELIVERS *Full Power* TO THE TOOL POINT

• Footburt machines are designed to deliver the full power to the tool point—where it is needed.

The No. 2 Footburt Sipp with back gear unit is a full range sensitive drilling machine with correct speeds for all types of work.

All eight speeds are obtained on belt drive machines or on motor drive machines with standard single speed motor — no special motors are needed. The simple design provides wide speed range at the lowest cost.

Write or wire for full information.

•

THE FOOTE-BURT COMPANY

CLEVELAND, OHIO

Detroit Office: 4-253 General Motors Building

FOOTBURT *Sensitive* DRILLING MACHINES

Step up your OUTPUT

WHETHER you use *metal* cutting tools or *grinding wheels,* you can increase output by using *Texaco cutting and soluble oils.*

Texaco cutting oils permit increased cutting speeds, prevent chip welding; assure smoother finish.

Texaco soluble oils keep the work cool; for grinding, the wheels stay clean, assuring increased output.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred also in the metal cutting field.

These Texaco users enjoy many benefits that can also be yours. A Texaco Engineer specializing in cutting coolants will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distribution points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

Write for 40-page booklet, "Lubricants and Coolants for Metal Cutting."

FOR YOUR ENJOYMENT

FRED ALLEN every Sunday night. See your local newspaper for time and station.

THEY PREFER TEXACO

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

TEXACO REG. T.M.

TEXACO Cutting and Soluble Oils
FOR THE METAL-WORKING INDUSTRY

RETURN METAL DRUMS PROMPTLY . . . thus helping to make present supply meet industry's needs and releasing metal for War Needs.

UNION

FOR FULL PRODUCTION CAPACITY

Unify all your metal-cutting jobs with UNION! The Union line covers practically every milling, drilling, tapping and reaming need, and in every Union Tool selection of steels, methods of manufacture and testing are guarded by the most exacting standards of tool making practice that insure equally high performance from every tool. Get full production capacity from every machine in your plant. Choose UNION—The Tools You Buy Again—for every job!

Milling Cutters
Gear Cutters—Hobs—Saws
Twist Drills—Reamers
End Mills—Taps—Dies
Ground Form Tools

Union Butterfield Card

DIVISIONS OF THE UNION TWIST DRILL CO.

UNION TWIST DRILL CO.
ATHOL, MASS.

S. W. Card Mfg. Co. Div., Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield Div., Rock Island, Quebec.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 6540 Antoine St.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

CARD

MEETS TODAY'S CHALLENGE OF PRODUCTION

No need to tell you that present production demands require the best in service and accuracy from every tool.

To get highest quality results from Card Taps, take advantage of Card Service . . . We will analyze your threading jobs from every angle and recommend the best procedure, the correct cutting speeds and, of course, the proper tap for every job.

Quality Taps plus Complete Service — a combination that goes a long way toward meeting today's challenge of production!

Union Butt

S. W. CARD MFG. CO.
MANSFIELD, MASS.

STORES

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DIVISIONS OF THE UNION TW

Butterfield TAPS CORRECT... and CAPABLE!

One of our big jobs in the nation's war program is to produce taps capable of handling the tough threading assignments of munitions production. For these exacting jobs, you can select Butterfield Taps with complete confidence in their ability to turn out long runs of accurate threads wherever the going is toughest!

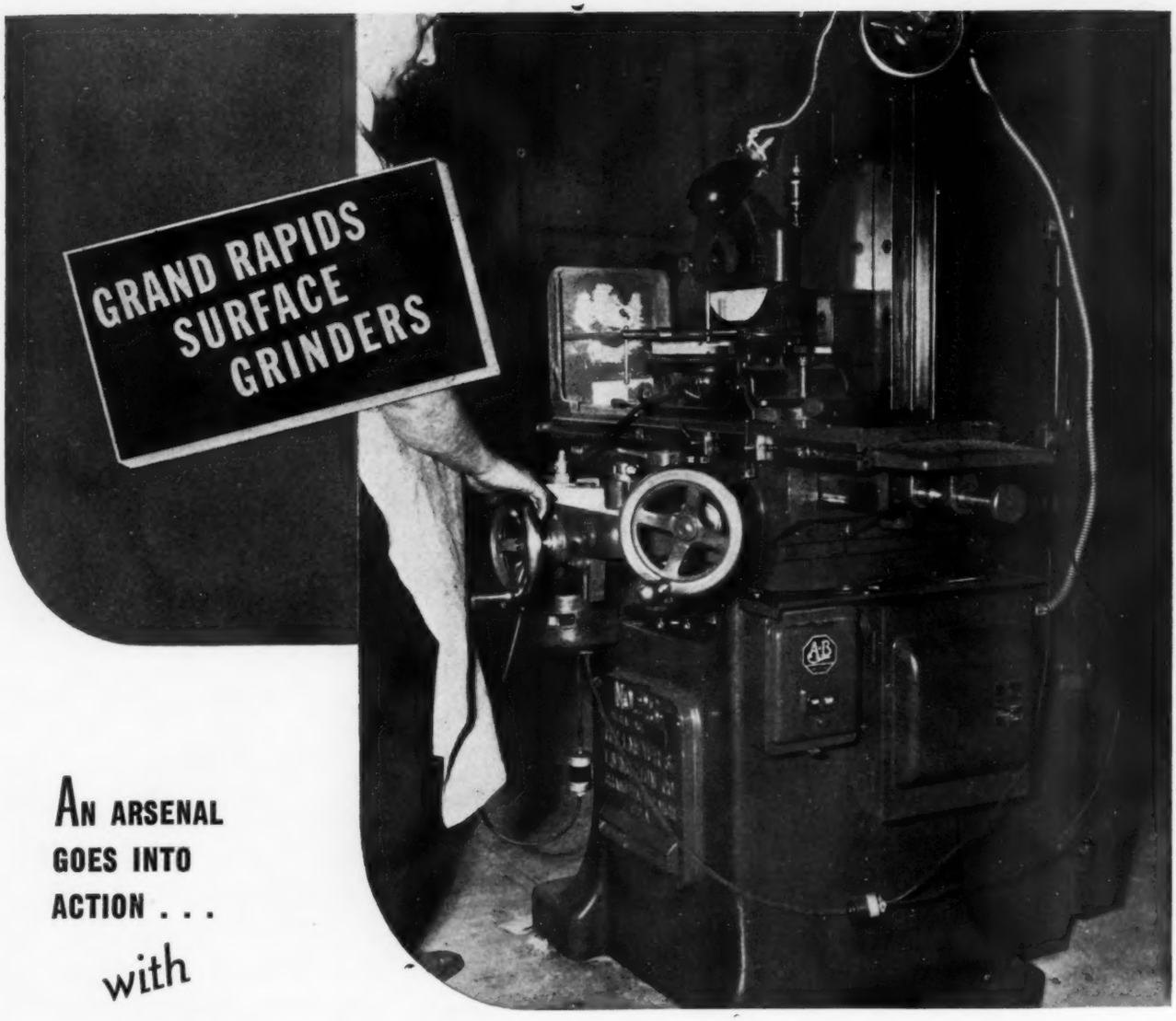
Write for details of
"THRED-RITE" DIES
for accurate external
thread production

...terfield Card

TWIST DRILL COMPANY

BUTTERFIELD DIVISION
DERBY LINE, VT. **ROCK ISLAND, QUE.**

STORES: New York, 61 Reade St. Chicago, 11 So. Clinton St. Cleveland, Hal. W. Reynolds, 3346 Superior Ave. Detroit, 6540 Antoine St. Los Angeles, 524 E. Fourth St. Toronto, 208 King St. West. Montreal, 111 St. Paul St., West. Winnipeg, 403 Travellers Bldg. Vancouver, 327 Shelly Bldg. Agents for Great Britain — Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S. E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.



AN ARSENAL GOES INTO ACTION . . . with

MODERN SURFACE GRINDERS • • •

Four Grand Rapids Surface Grinders serve the Tool Room at Springfield Arsenal. One of these modern machines is shown in action here on a tool steel bar. This machine is designed primarily for tool room work and is the fastest unit of its size and type in the Grand Rapids line.

The sturdiness, ruggedness and flexibility of these machines makes them especially adaptable to tool room work. They can be depended on for high accuracy in long hard service.

Standard features include hydraulic longitudinal and transverse table movements. A swivel type wheel guard facilitates use for form tool grinding. Cross feed hand wheel is graduated for operator's convenience.

Grand Rapids Surface Grinders are offered in sizes and types for all modern requirements. They are the result of more than 35 years specialized experience in the design and building of high quality, precision grinding equipment.

Ask our engineers to show you how, by going into action with Grand Rapids Surface Grinders, you can cut costs and improve the quality of your work.

For Additional Information Write for Catalog GL-100.

GALLMEYER & LIVINGSTON CO.
330 STRAIGHT AVE.
GRAND RAPIDS, MICH.

DON'T BLOCK THE TRAFFIC!

Petty arguments only delay the more important tasks at hand. Friction destroys both men and machines; it blocks the traffic.

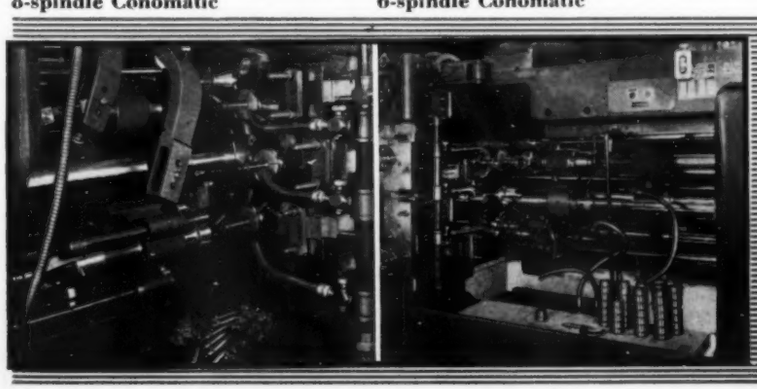
The most important traffic lanes right now lead to the front lines where men are pulling together to defend the cause of freedom.

It is the job of those behind the lines to keep supplies rolling into these great traffic lanes, faster and in greater volume. It is the job of mass production.

Conomatics and their operators are working 24 hours a day, 7 days a week, producing parts vital to defense. These sturdy, accurate, fast, volume-producing machines, like the country in which they are built, are symbols of Unity — Stamina — Action.

Write, wire, or phone for information on Conomatics.

Shell bodies coming from 8-spindle Conomatic **Fuse bodies coming from 6-spindle Conomatic**



IF IT'S A CONE IT'S ACCURATE

CONE

AUTOMATIC MACHINE CO., INC.
WINDSOR, VERMONT

Don't Gamble— with Your Cutting Tools

THIS IS NO TIME TO TAKE CHANCES

With Your Tool Room Grinding Jobs

TAKING CHANCES is part of the game with poker—but not with cutting tools. The stakes are too important NOW. Cutting tools must be sharpened carefully and correctly for two important reasons:

1. so each tool will deliver maximum life,
2. so each tool will perform at maximum efficiency on its machine.

You can't afford to take chances with your grinding wheels or your grinding methods.

When you specify Norton Tool Wheels you know you are eliminating the gamble. You are getting wheels developed by Norton research especially for tool room service. You are getting wheels made by skilled Norton workmen using the most modern manufacturing facilities. And Norton engineers will be glad to help you select the proper wheels for your particular tool room jobs — B-E bond Alundum wheels for high speed steels and Stellite, Crystolon wheels and diamond wheels for the cemented carbides.

Several Norton booklets on tool room grinding are available—write for those which will be most helpful to you:

A Handbook on Tool Room Grinding.....Form 835AM
Grinding Carbide Tipped Tools.....Form 167AM
Grinding "Haynes Stellite" Cutting Tools.....Form 571AM
Refined Surface Finishes on Cutting Tools.....Form 986AM

NORTON COMPANY, WORCESTER, MASS.

W-861

NORTON ABRASIVES

Wheels to Use for Sharpening Tools and Cutters

Cutters

Milling cutters (plain, side, face, etc.)
- Straight or Cup wheel 3846-K5BE
- Ingersoll Cutter Grinder 3846- J5BE

Formed cutters (gear, hobs, etc.)
- Dish wheel 3846- J5BE
- Barber-Coleman hob grinder 3860- J5BE

Reamers
- Cylindrical grinding 50- L5BE
- Backing-off 3846-K5BE

Drills

Sharpening (offhand)
- Large drills 36- P5BE
- Small drills 60-N5BE

Sharpening (machines)
- Large drills 46- L5BE
- Small drills 3860-K5BE
- Point thinning 60-N5BE
- Cutting-off 60-M4L

Taps
- Grinding chamfer 3860- L5BE
- Cutting-off broken ends 60-M4L

Broaches

Sharpening (face grinding)
- Dish wheel 3880-K6BE

Backing-off
- Cup wheel 3860- L5BE

Thread Chasers

Milled and tapped chasers
- Grinding chamfer (or throat) 3846-K5BE
- Grinding cutting face 3846-K5BE

Tangent chasers
- Straight wheel 3860-K5BE
- Cup wheel 3846- J5BE

Circular chasers
- Straight wheel 3860-K5BE
- Cup or dish wheel 3846- J5BE

Tools (Lathe and Planer)

Offhand grinding
- Bench and pedestal grinders (coarse) .. 36-O5BE
- Bench and pedestal grinders (fine) 60-N5BE

Wet tool grinders
- 12 to 24" diameter 30-O5BE
- Over 24" diameter ..... 24-PS (silicate) or 24-M5BE

Machine grinding
- Sellers 15" diameter 36- L5BE
- Sellers 24" diameter 24- L5BE
- Gisholt 24- L5BE

Stellite Tools and Cutters

Offhand Grinding
- Dry 46-N5BE
- Wet 46-O5BE

Machine Grinding
- Gisholt or similar tool grinder 1936-K8BE

Cutter Grinding
- Cup or dish wheels 3846- J5BE

Surface Grinding
- Straight wheels 3846-H8BE
- Cup or cylinder wheels 3846-G8BE

Cemented Carbide Tools and Cutters

Lathe and planer tools

Offhand grinding
- Roughing (straight wheel) 3760-J7
- Roughing (cup wheel) ..... 3760-I7 or 100-M (diamond, metal bond)
- Finishing (cup wheel) ..... 37100-H7 or 220-B50 (diamond)
- Comb. rough and finish ..... 120-M (diamond, metal bond)

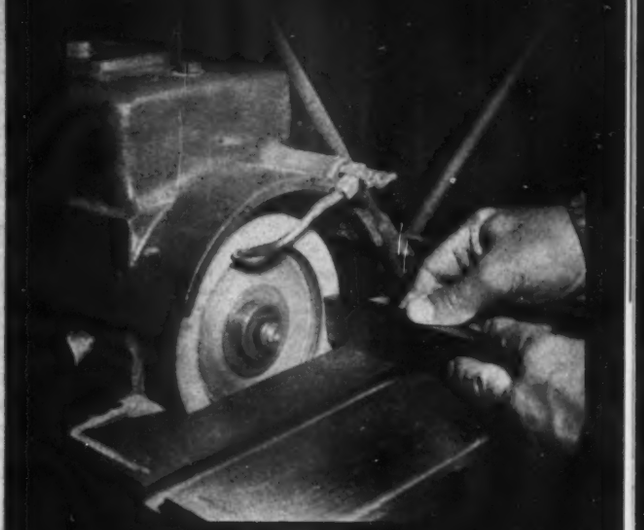
Machine grinding
- General purpose (straight wheel) ... 3760-J7
- General purpose (cup wheel) 3760-I7

Surface grinding (straight wheel) ..... 3760-I7 or 100-B100 (diamond)

Cutter grinding
- Roughing ..... 3760-I7 or 100-B100 (diamond)
- Finishing ..... 37100-H7 or 220-B100 (diamond)

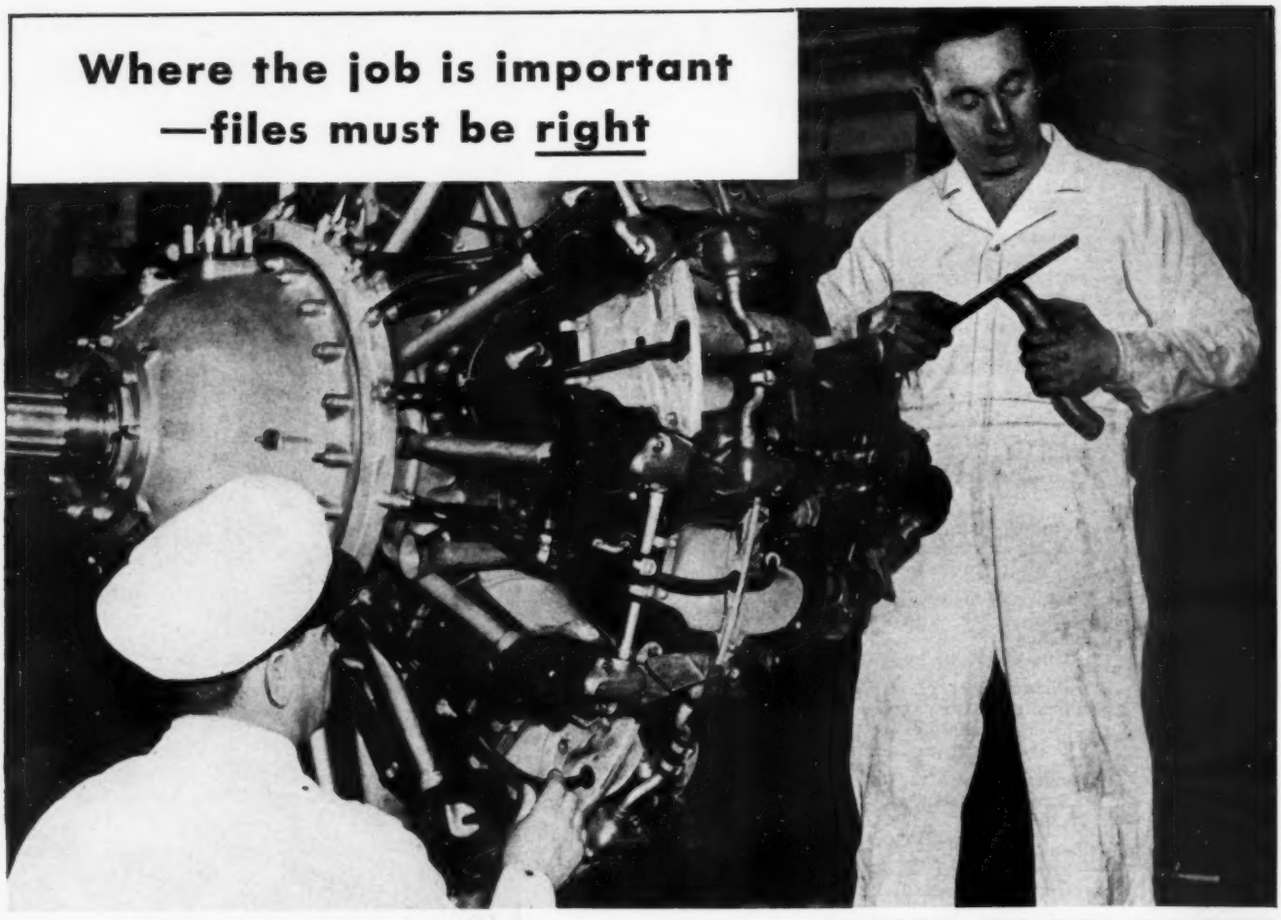
Hand Stoning
- Diamond hone ..... 220-B100 (diamond)
- Crystolon stick 37280-N

These recommendations may be used as a general guide but individual conditions in different tool rooms may necessitate some modifications.



NORTON ABRASIVES

Where the job is important —files must be right



Ace mechanic touching up an oil-line fixture before attaching to engine being inspected during overhaul job. Courtesy United Air Lines.

To carry assurance of Victory, America's war effort must be *efficient* as well as huge. In engine, aircraft, guns, shells and precision instruments, for example, not a single detail must be left to execution that is just "good enough." Only "the best job that can be done" gets the vigilant inspector's okeh.

Such high standards of workmanship—in *any* industry—demand the right tool, as well as the right man, for the job. In a file it means one that is *correct* in design and size for the kind of metal, shape or part on which it is used; for the amount of metal to be removed and the finish or precision to be attained.

In addition, it must be thoroughly *dependable*—of uniformly fine steel, uniform cut, uniform hardness . . . so that the hundredth file will render exactly the same performance as the first.

There is no better file-selecting guide than the recommendations of the largest manufacturer of quality files in the world—under the Nicholson guarantee of *Twelve perfect files in every dozen.*

Three Nicholson special-purpose files extensively used in war and other industries are shown and briefly described at the right. TECHNICAL BULLETINS on these, and also on files for Foundry Castings, Die Castings, Lead, Plastics; and for Die-making, Shear Tooth and Lathe filing, will gladly be mailed on request. Name ones desired. For your file needs, contact your mill-supply house.

NICHOLSON FILE CO. • PROVIDENCE, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

ALUMINUM TYPE "A" FILE. Special serrated-tooth and open-throat cut—to prevent clogging and "chatter." For rapid filing of aluminum and other ductile-metal castings, bars and sheets. In flat and half-round shapes, and full range of sizes.

BRASS FILE. In addition to a short upcut angle, the teeth of the Nicholson Brass File are made with a very fine and long-angle overcut. This produces small scallops which break up filings and enable file to clear itself of chips. Also prevents "grooving."

STAINLESS STEEL FILE. To combat the abrasive action of this steel's hard chromium carbides and nickel alloy, the Nicholson Stainless Steel File is made with teeth cut unlike that of any other file. It enables fast stock removal on thick-section work; smooth filing on thin sections.

NICHOLSON FILES
FOR EVERY PURPOSE

NICHOLSON U.S.A. MADE IN U. S. A.

"PUT IT ON THE BLANCHARD"

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

★ Production

★ Adaptability

Fixture Saving

★ Operation Saving

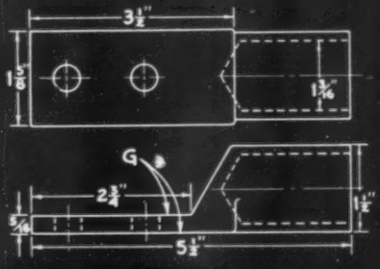
Material Saving

Fine Finish

Flatness

Close Limits

★ . . . Especially valuable on jobs like the one illustrated.



CARPENTER MFG. CO.

Less Than

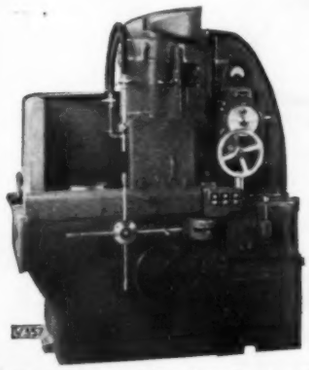
TWO MINUTES EACH

THESE copper lugs for large cable are ground on both sides on a No. 11 Blanchard Surface Grinder in Blanchard designed fixtures.

Both sides of the castings are ground to clean up — to close limits for parallelism. The floor to floor time is less than two minutes each.

This is a good example of work with a projecting surface that can be ground to advantage on a Blanchard. This is accomplished by mounting the lugs in the fixtures with the round end toward the center of the chuck. The chuck is moved under the wheel to the proper depth and then the wheel is fed down until all the surfaces on one side are ground clean. The same method is used for grinding the surfaces on the other side.

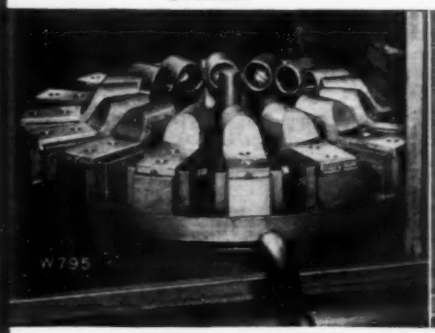
Whether your work requires fine finish or extreme accuracy — whether it requires light finishing cuts or hogging cuts, the Blanchard No. 11 will do the job quickly and economically.



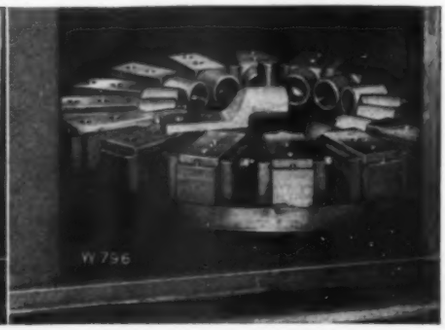
Blanchard No. 11 Surface Grinder

BLANCHARD
MACHINE COMPANY
64 STATE ST., CAMBRIDGE, MASS.

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



Grinding offset side of lugs



Grinding flat side of lugs

SLOCOMB

SLOCOMB MICROMETERS ARE USED ALL OVER THE WORLD.

SLOCOMB MICROMETER SETS

Nos. 22 and 28

Set #22 comprises 12 micrometers and 11 end measures. It will handle work measurements from 0-12" by thousandths. Also available for metric measurements from 0-300 m.m. by 1/100 m.m. All instruments conveniently housed in hard wood case.

Set #28 (not shown) also consists of 12 micrometers and 11 end measures for a size range from 12" to 24" by thousandths. Also available for measurements from 300-600 m.m. by 1/100 m.m.

In addition, Slocomb standard micrometer sets are made for measurements from 24" to 60" or 600 m.m. to 1500 m.m.

SLOCOMB SNAP GAUGE MICROMETERS

These fast instruments eliminate guesswork in inspection and eliminate the necessity for handling a wide variety of snap gauges. Work can be gauged as it progresses with utmost speed and accuracy.

Available in sizes from 0-1" to 11-12"; metric sizes available from 0-25 m.m. to 275-300 m.m.

SLOCOMB MICROMETER CALIPER

No. 22

A highly accurate instrument, small and sturdy, light in weight, easy to use and convenient to handle. Weighs only 1¾ oz. Measures all sizes from 0 to ½ inch by thousandths. Available also in metric graduations.

Can be furnished with plain or friction stop.

J. T. SLOCOMB CO.,

Precision MEASURING INSTRUMENTS

. . . provide many opportunities to speed production by speeding inspection

Long-lived, accurate SLOCOMB MICROMETERS have been accepted for more than fifty years as the Standard for precision measuring.

In entering its second half century of service to the metal working industry, SLOCOMB has anticipated today's urgent need for fast, accurate measuring.

In the SLOCOMB precision measuring instruments which are available today, machinists, inspectors and shop men are finding it possible to speed up checking and inspecting. By saving valuable time on this work, SLOCOMB instruments are contributing to the faster production which is the vitally important order of the day.

SLOCOMB CENTER DRILLS

Available in either carbon or high speed steel in Center Drill, Combination Center Drill and Bell Type Center Drill Types. Sizes: Center Drills from ⅛" to 1"; Combination and Bell Type from ⅛" to ¾".

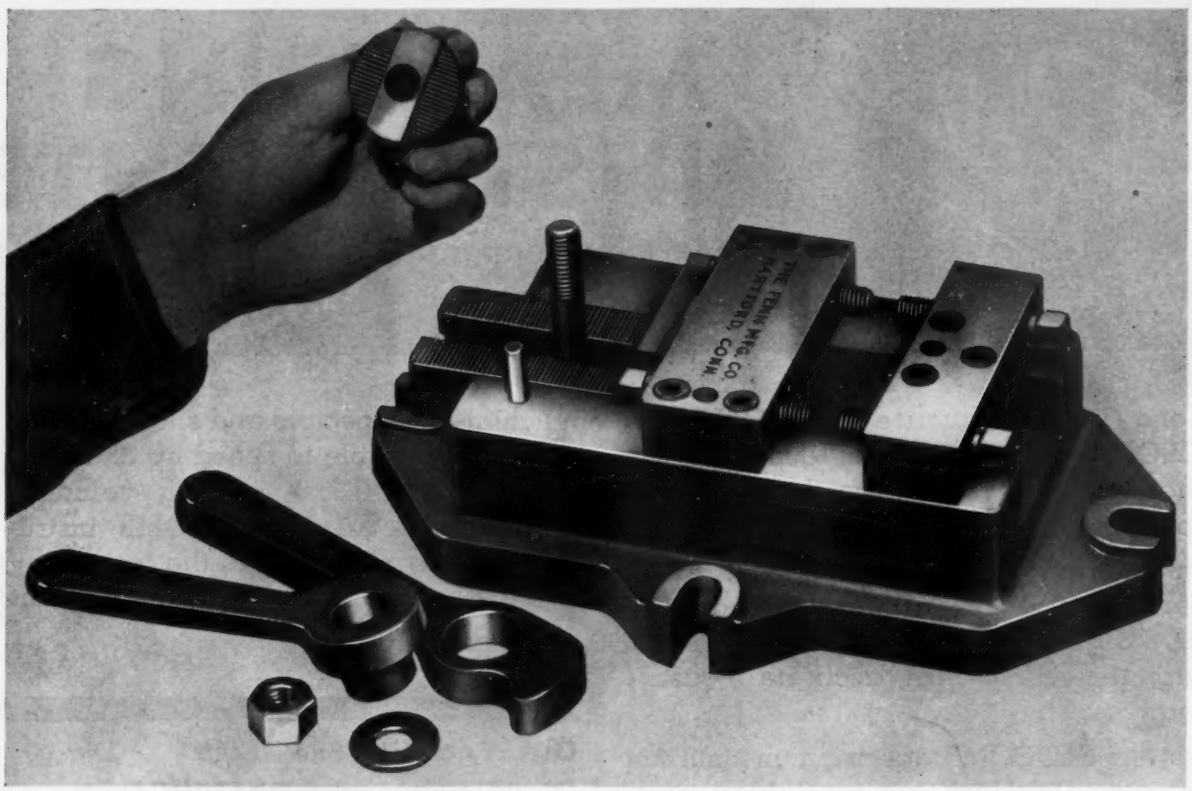
WRITE TODAY FOR THE 112-PAGE SLOCOMB CATALOG

Ask for Catalog No. 18. It contains complete information on the entire line of SLOCOMB precision instruments and center drills. Sent FREE and promptly on request — a valuable aid to any machinist, inspector or shop man.

OUTSTANDING FEATURES OF DESIGN AND CONSTRUCTION

Arrangement of nuts insuring long bearing in spite of wear.
Decimal equivalents stamped on thimble.
F—Thimble.
Short nut—D to compensate for wear in threads.
No split in sleeve to admit dust and dirt and cause rapid wear.
Nut—C ⅝" long, twice as long as bearing in other micrometers. Can be replaced when worn.
Nickel silver spring E. Gives uniform tension on screw.
.270" diameter screw and anvil. This gives 16½% more wearing surface at this point than .250" diam.
Adjusting nut — C to overcome wear on anvil or screw. Replaceable, giving entirely new bearing for screw.
Solid inserted anvil—G.
One piece hard tool steel screw—A.
Accurately fitting bushing—H insures close fit for screw. Replaceable.
I section frame — B drop forged from bar steel.
Black enameled or polished frame.

PROVIDENCE, R. I.



USE THE FENN QUICK-ACTION VISE FOR
MILLING, DRILLING, TAPPING AND ASSEMBLING

AIR PLANE ENGINE PARTS

MACHINE GUN PARTS

AUTOMOBILE PARTS

ELECTRICAL EQUIPMENT

TOOL MAKING

PRECISION INSTRUMENTS

COMPENSATORS, ETC.

4" — 5" — 7" SIZES

Here's the Secret of Fenn's Powerful Grip and High Speed

Serrated surfaces both on sliding jaw and clamp bushing give positive holding security. No possible chance of work slipping with this positive gripping feature. No shearing strain on clamp bolt either; only tensile strain for which it is amply heavy. The serrated surfaces mesh perfectly—uniformly; yet can be instantly released for quick adjustment to other work. Quick Action Cam Lever throws jaws together instantly. The Eccentric Handle locks the work in a powerful grip.

Send for Bulletin No. 10
with complete specifications

THE FENN MANUFACTURING COMPANY
HARTFORD, CONNECTICUT • ESTABLISHED 1900

550 MULT-AU-MATIC JOBS IN *one* PLANT!...

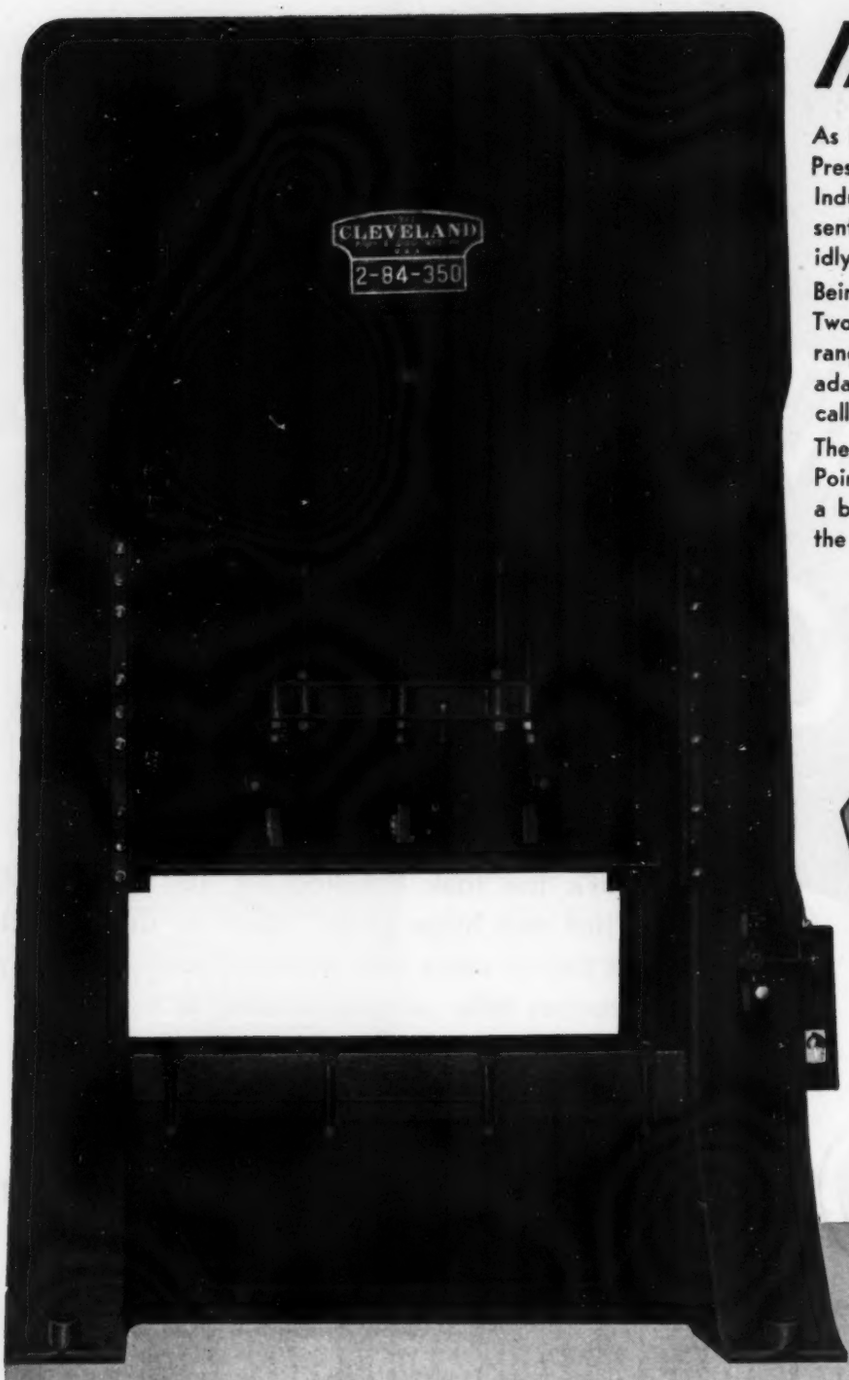
That's the task handled by 108 Mult-Au-Matics in just one huge plant. Each of these machines has five or more jobs assigned to it, and the plant manager tells us that tooling is so flexible that changeover from one job to another on any machine can be accomplished in only three or four hours.

The facts speak for themselves. Mult-Au-Matics and the Mult-Au-Matic method are without a peer in modern production practice.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

The POWER *of* INDUSTRY

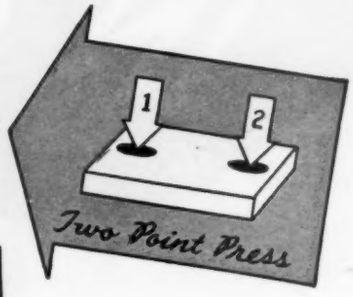


As in peace so in war, Modern Cleveland Presses are providing the Metal Working Industry with the POWER to produce essential parts more accurately, more rapidly and more economically.

Being built in three types—Single Point—Two Point and Four Point, and in a wide range of sizes and capacities, they are adaptable to a wide variety of the work called for in an "all out" program.

The Press illustrated is a Cleveland Two Point which has a capacity of 350 tons, a bed area of 51" x 84" and operates at the rate of 14 strokes per minute.

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY · · *Cleveland, O.*



MECHANICAL POWER PRESSES give greater Sustained Production than any other type.

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is the most accurate and easily handled Radial Drill we ever used . . .

—A STATEMENT BY THE
BELL AIRCRAFT CORPORATION
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The above statement by the Bell Aircraft Corporation refers to countless advantages derived from the Super Service Radial. In this important Defense Plant the Radial illustrated is used primarily for jobs on tools and fixtures where accuracy, speed and ease of handling are advantages of extreme value. Applied to many such operations—and more generally to quantity production—the numerous Cincinnati Bickford Super Service Radials in service today are proving their value as one of America's leading Tools for Defense. Bulletin R-21A lists all features and gives complete details.

A typical heavy duty job calling for close Aircraft precision for which the Super Service Radial is ideally suited.

THE CINCINNATI BICKFORD TOOL CO.

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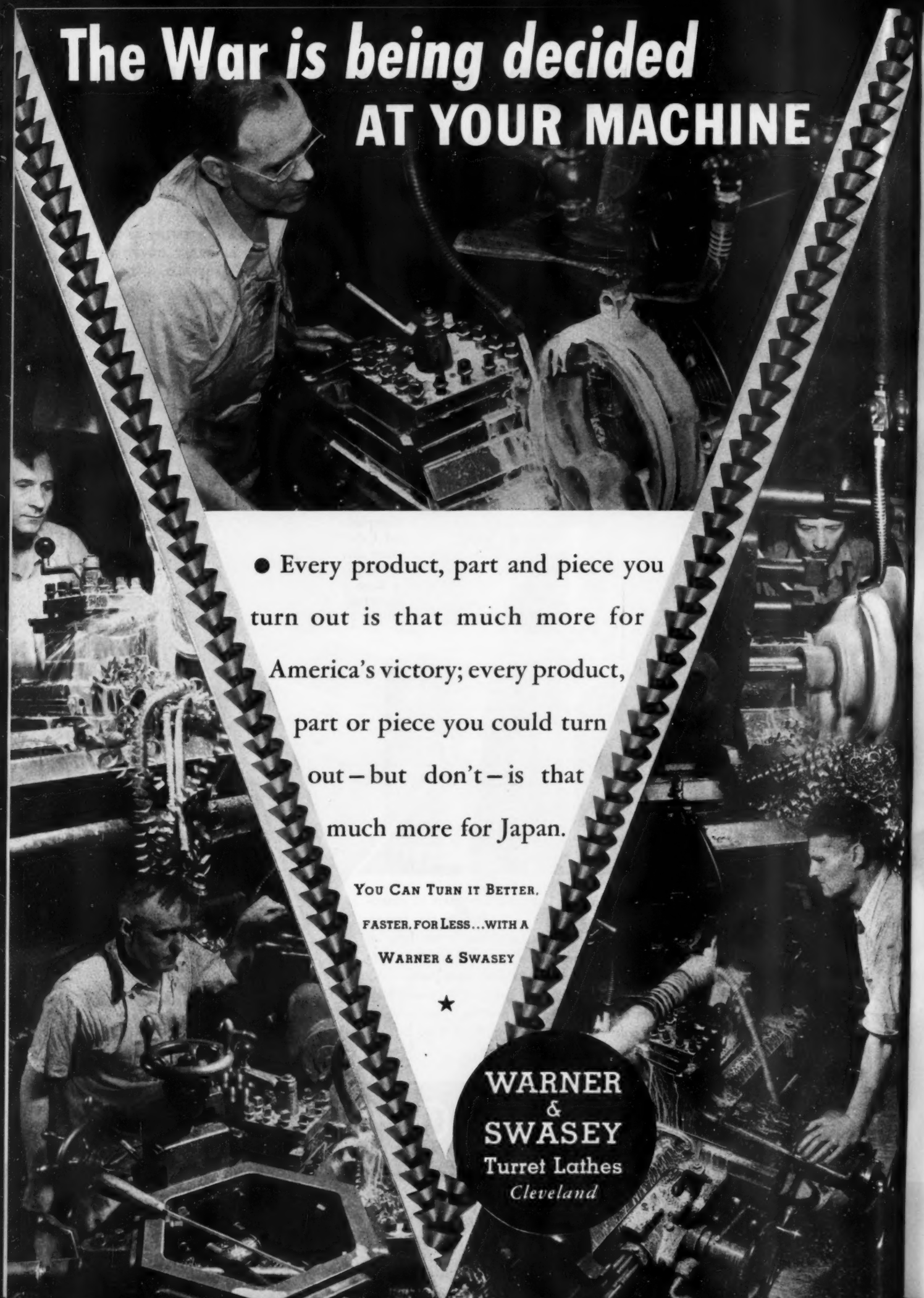

The War is being decided
AT YOUR MACHINE
● Every product, part and piece you turn out is that much more for America's victory; every product, part or piece you could turn out – but don't – is that much more for Japan.
YOU CAN TURN IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY
★
WARNER & SWASEY
Turret Lathes
Cleveland

WHAT'S IN THIS ISSUE

FRANK CURTIS

TIPS BY A.S.T.E. HEAD

Frank Curtis, president, the American Society of Tool Engineers, and chief engineer, Van Norman Machine Tool Company, tells how his concern tips its own carbide tools (page 204). A system for keeping a stock of tip blanks in line with the number of tools on which they are used has proved helpful. Perhaps it would work as well in your plant.

CUTTERS IN CANADA

Appropriately, our Armament Section this time is devoted to cutter conservation. Canada started its war program with a dearth of small tools, but by increased tool-making facilities and careful handling of existing tools, has avoided a critical shortage. Described on page 233 is a good example of well planned tool control.

FINIS

With this issue, J. G. Magrath takes a well earned bow. His series on oxyacetylene flame hardening is concluded with an article on page 217. In the course of eighteen installments, he has covered the subject from selection of materials to machine set-ups—a fine piece of work.

FOR THE SMALL SHOP

Did you ever hear of a one-hand prick punch? A. H. Waychoff describes one on page 211 together with many other time savers for the small shop.

PLENTY OF OIL

You may economize on oil for your furnace but use plenty on cutting tools if you want to boost output. But what oil and where? Read "Working With Cutting Fluids," prepared by W. J. Hargest (page 225), for the answer.

HOLD TIGHT

John G. Jergens, Cleveland Pneumatic Tool Company, contributes another of his picture spreads on tooling devices. This time his subject is special chucks. See pages 220 and 221.

TO CUT WITH ABRASIVES

We start in this issue a three-part series on abrasive cut-off. Written by H. G. Robinson, Andrew C. Campbell Division, American Chain and Cable Company, it will explain just how this process is applied and what advantages result. As Mr. Robinson has done a great deal to develop abrasive cut-off you will want to read his article on page 206.

H. G. ROBINSON

RECTANGULAR SHELLS

Readers interested in press work will want to see page 214 which begins Mark Golden's article on forming rectangular shells. He offers an ingenious solution to a tough punch and die problem.

KEEP 'EM CUTTING

Henry Disston & Son hit upon a fine idea in its Conservation Control Cards, a series that is sure to save thousands of dollars worth of tools. We are privileged to reproduce these cards for the benefit of our readers. See our Reference Book Sheets, pages 245 and 247, for the first two.

I. A. SWIDLO

BATTLE OF TOOLING

What can the tool engineer do to win the war? I. A. Swidlo, of Springfield Armory, gives the answer and illustrates it with some practical illustrations (page 209). He shows how tooling ideas can save many hours of work in the shop.

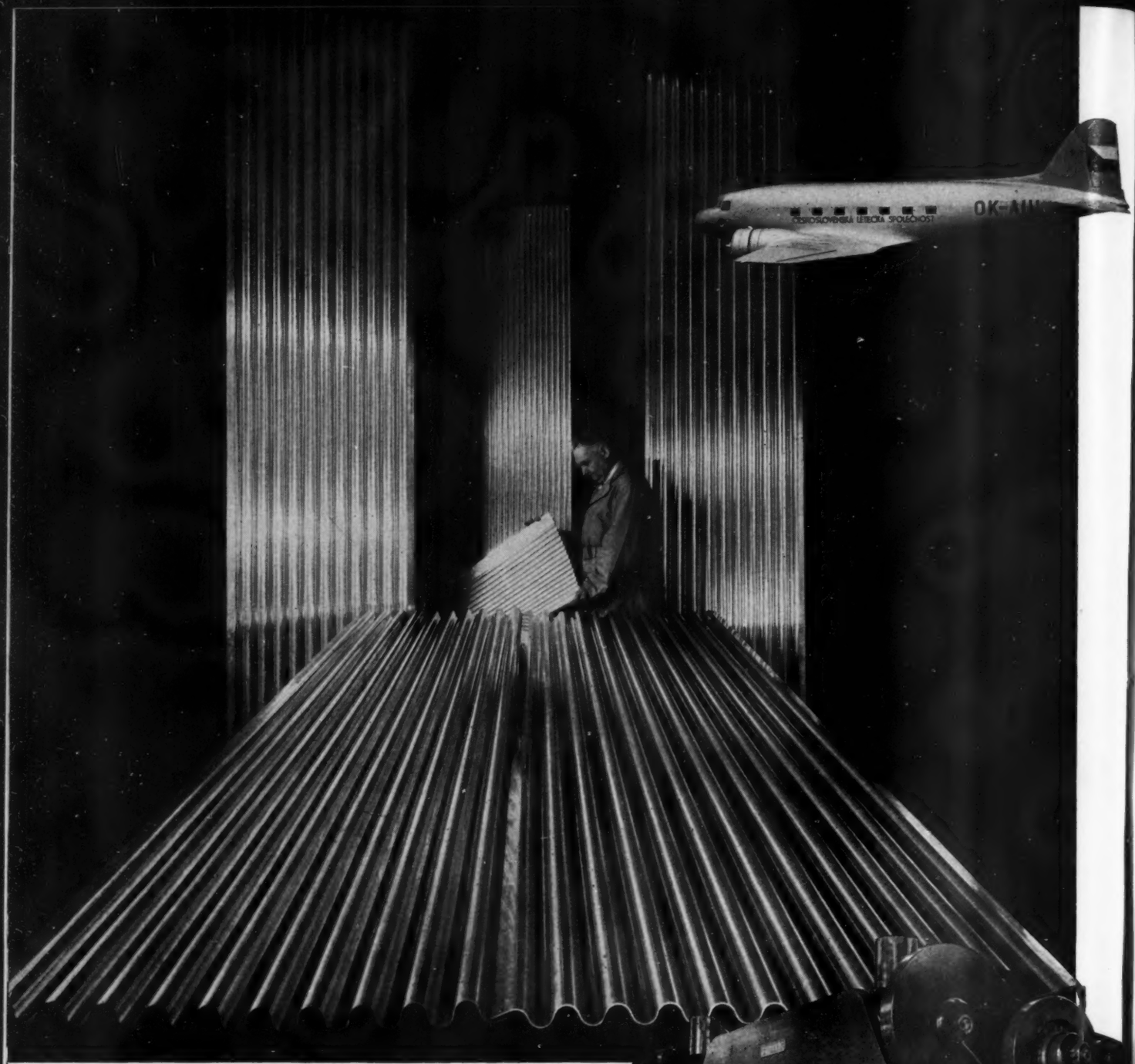
FOR JEEPS?

Jacks will be needed even though new autos are taboo. Fixtures for making them are described on page 212, in a practical tooling article by Herbert Chase.

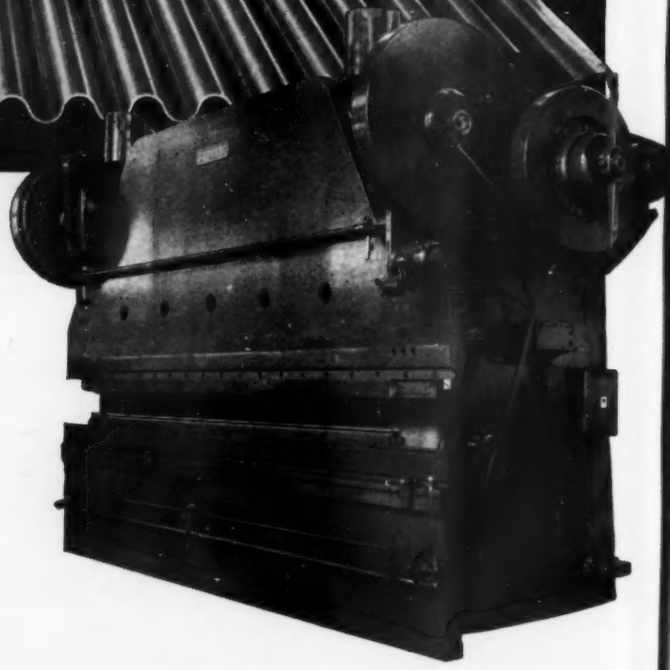
COMING

Putting every available machine on war work is necessary to meet an enormous production program. Westinghouse as a prime contractor, has taken a leading part in spreading its orders to smaller shops. George P. Longabaugh, of this company, will tell how its subcontracting department is organized and how it operates.

Man power is needed today at the front and in the shops supplying the front. Men have to be trained to fight and to work intelligently. Fred A. Firnhaber, Landis Tool Company, will describe in an early number the methods his company uses to train men for machine tool manufacture.



16′ sheets for modern transport planes, formed on a 340 Series Cincinnati All-Steel Press Brake.



FOR the Wings of Man ... aluminum alloy sheets must be accurately corrugated ... a job typical of the machine tool accuracy of Cincinnati Press Brakes ...

THE CINCINNATI SHAPER COMPANY

CINCINNATI, OHIO

TOOLING FOR WAR

TODAY the United States is in the midst of the biggest retooling program ever undertaken. A new armament industry is being created—an industry that did not exist a few months ago.

We are not manufacturing products for our own comfort or to insure a high living standard—we are producing arms for a war to destroy enemies who threaten our very existence. Comforts and living standards will have to take second place until this job is done.

We must direct every resource toward gearing our industry for its gigantic task of making planes and tanks and arms of all kinds. We must convert old plants to war needs, build new plants and utilize every available piece of manufacturing equipment. Every step requires tool engineering—tooling for war.

Tooling is necessary to convert machines from peacetime uses to wartime needs. If it is done wisely and well, thousands of machines will be made available and millions of man-hours will be saved. We can reach our objective only if we forget selfish interests; we must be willing and ready to interchange ideas and technical data to advance our common cause.

This cause provides an opportunity for the tool engineer; a chance to render a direct service to this nation and to the nations allied with us, that compares in importance with service on the battlefront.

The men on those fronts are waiting for more guns and planes and tanks. The men in camps, toughening up for their posts of duty here and abroad, need military equipment to make their sacrifices effective.

Let us give them what they need. Let us direct our technical skill to the quick completion of this big job. Let us provide the tools of war so this war can be quickly won.

Tipped Tools in a Hurry

BY FRANK W. CURTIS, CHIEF ENGINEER, VAN NORMAN MACHINE COMPANY

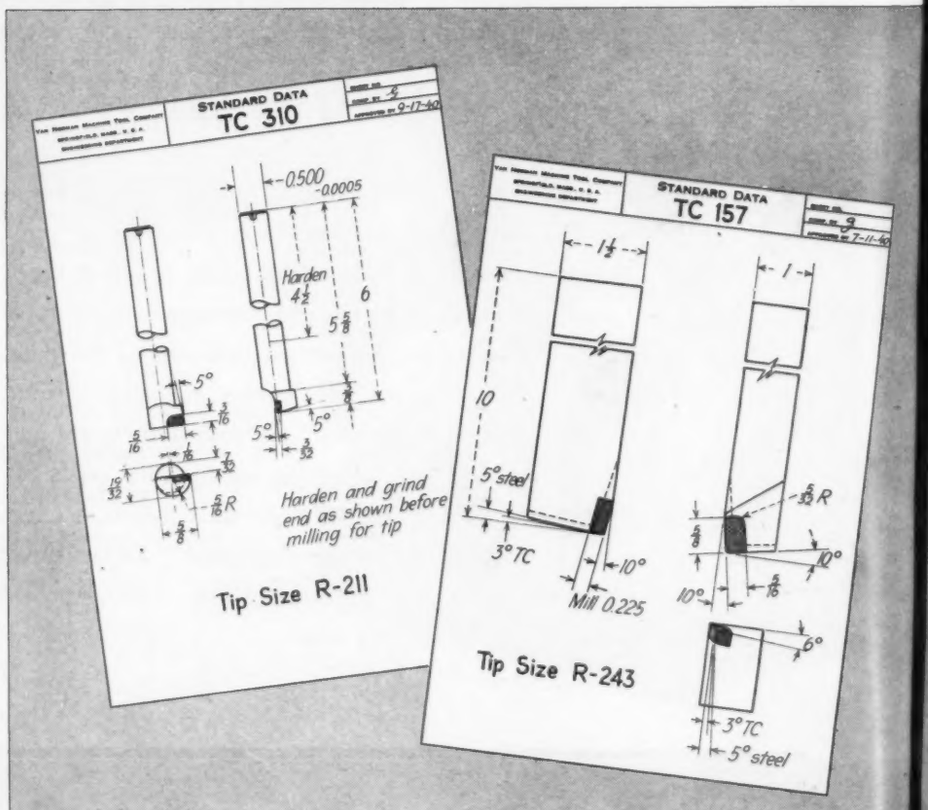
Van Norman tips its own tools to avoid delays in production. A reference chart helps keep a good supply of blanks on hand

TO GET CARBIDE-TIPPED tools quickly, the best procedure is to make your own. Tungsten and tantalum carbide blanks can be obtained readily, and the making of carbide-tipped tools is not at all difficult. Nor, is much equipment needed for this purpose. To do the job right, however, it is necessary to set up a procedure whereby these tools can be produced in fairly large quantities.

Our experience in using carbide-tipped tools over a period of years has led us to set up a small department arranged specially for their manufacture. With this equipment we are able to turn out as many as 500 tools a day. In some cases we have completed special tools in less than one hour from the time they were requested.

This bench-type fixture is arranged to hold all sizes and shapes of tool shanks for rapid brazing of carbide tips in place. Note that a clamp rod holds the tip in position while the brazing operation is being completed. In some cases special tools have been completed within an hour after the sketch was made

Each carbide-tipped tool is sketched on a standard data sheet, as shown in the two examples at right, and each is numbered according to a prearranged series. In addition to showing the necessary dimensions and clearance angles, each tool sketch specifies the standard tip to be brazed onto the shank



All tools used in our plant are given a number, and then laid out on a standard data sheet. The tool numbering system is arranged so that all Series 100 to 200 tools are for turning purposes. Series 300 tools are for boring, and Series 400 for milling. All tools are designated with a "TC" symbol. Therefore, a tool bearing the number TC-307 would be one designed for a boring operation.

Master Chart Shows Tips

On the tool drawing we specify the size and style number of a standard carbide tip, and show all necessary dimensions and clearance angles. Every tool in use is recorded on a master carbide-tip chart, so that it is possible to determine at a glance how many tools are made up with a given tip. This chart aids in purchasing carbide tips. For example, by reference to the chart we know that tips No. R-223 and No. R-229 are popular sizes and should be ordered in fairly large quantities. We have set up a minimum stock for all tip sizes, and upon reaching this minimum an order is placed for a predetermined quantity. For example, on tip R-223, when the stock is reduced to approximately 20 tips, an order is placed for 100 tips for stock.

It also has been our practice to standardize on tool shank sizes, and we attempt to carry in stock a sufficient quantity of steel to meet the normal demand. Here, again, when a minimum quantity is reached we reorder at once from our suppliers.

Today, when it is very difficult to obtain materials, we have to watch our supply of carbide tips and shank steel carefully, and to allow somewhat more than the normal time required for replacement. Since these two items are the sole requirements for making tools, it is well to keep an accurate inventory and, in addition, to anticipate any unusual demand that might be made on either item.

Having established a complete line of carbide tips, together with the standard shanks used in their manufacture, the remaining problem is that of building the tools themselves. We have developed a simple brazing fixture comprising a V-block and clamp which properly holds all sizes and shanks. Brazing is done by heating with an oxy-acetylene torch in the usual manner. First, the shank is heated from the under side. Then the torch is brought up to the top side of the tool and when the proper heat has been reached the tip is clamped firmly in place. Having the tool shank clamped in the fixture facilitates this procedure.

The milling of the recesses in tool shanks is done in a small milling machine equipped with a universal fixture. This fixture can be adjusted angularly in three different positions. These adjustments provide for all combinations of angles in any plane. The same type of fixture also is used when grinding chip breakers in carbide-tipped tools for cutting steel. The grinder used for this operation is a small hand feed machine which, with the full universal fixture, can be set up very quickly.

Reconditioned With Diamond Wheels

Turning tools are sharpened in a floor-type grinder of the conventional type. Most of these tools are rough ground with vitrified wheels, then finish ground in another machine equipped with diamond wheels. Usually the reconditioning of tools can be handled entirely with diamond wheels. However, where the tips have become chipped or excessively worn, they first are rough ground and then diamond finished. For flat boring tools and blanks for milling cutters, our process is to surface grind a quantity at one time on a magnetic chuck placed on the table of a standard surface grinder.

After a careful study of all machining operations in the shop, a group of standard and special tips for carbide-tipped tools was selected. These are sketched on the chart below, and each tool made up with one of these tips is tabulated on the chart in order to show at a glance the active sizes which must be reordered frequently. By standardizing tips and shanks, it is possible to maintain a stock which permits making up needed tools quickly

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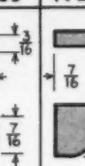
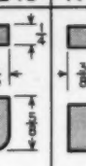
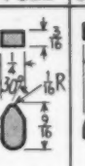
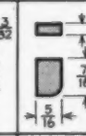
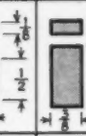
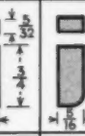
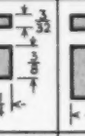
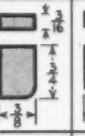
														
TC 302	TC 308 TC 401 TC 402 TC 313 TC 315 TC 318	TC 176 TC 304 TC 305 TC 403 TC 404 TC 303 TC 134 TC 309 TC 314 TC 315 TC 321	TC 306 TC 320	TC 307 TC 207 TC 161	TC 130 TC 131 TC 132 TC 133 TC 160 TC 202 TC 107 TC 300 TC 301 TC 105 TC 162	TC 158 TC 159		TC 110 TC 111 TC 112 TC 150 TC 151 TC 152 TC 153 TC 154 TC 155 TC 156 TC 157 TC 206 TC 135		TC 106 TC 108	TC 175	TC 204	TC 201 TC 205	TC 203

TC-100-300 Lathe tools
TC-301-400 Boring tools
TC-401-500 Milling tools

R 111-A	R 211	R 213	R 222	R 122	R 123	R 129A	R 235A		R 112	R 238	R 236B	R 137		
														
TC 177	TC 312 TC 310 TC 311 TC 316			TC 212	TC 211	TC 209	TC 210		TC 317		TC 224	TC 225		

Why Use Abrasive Cutting?

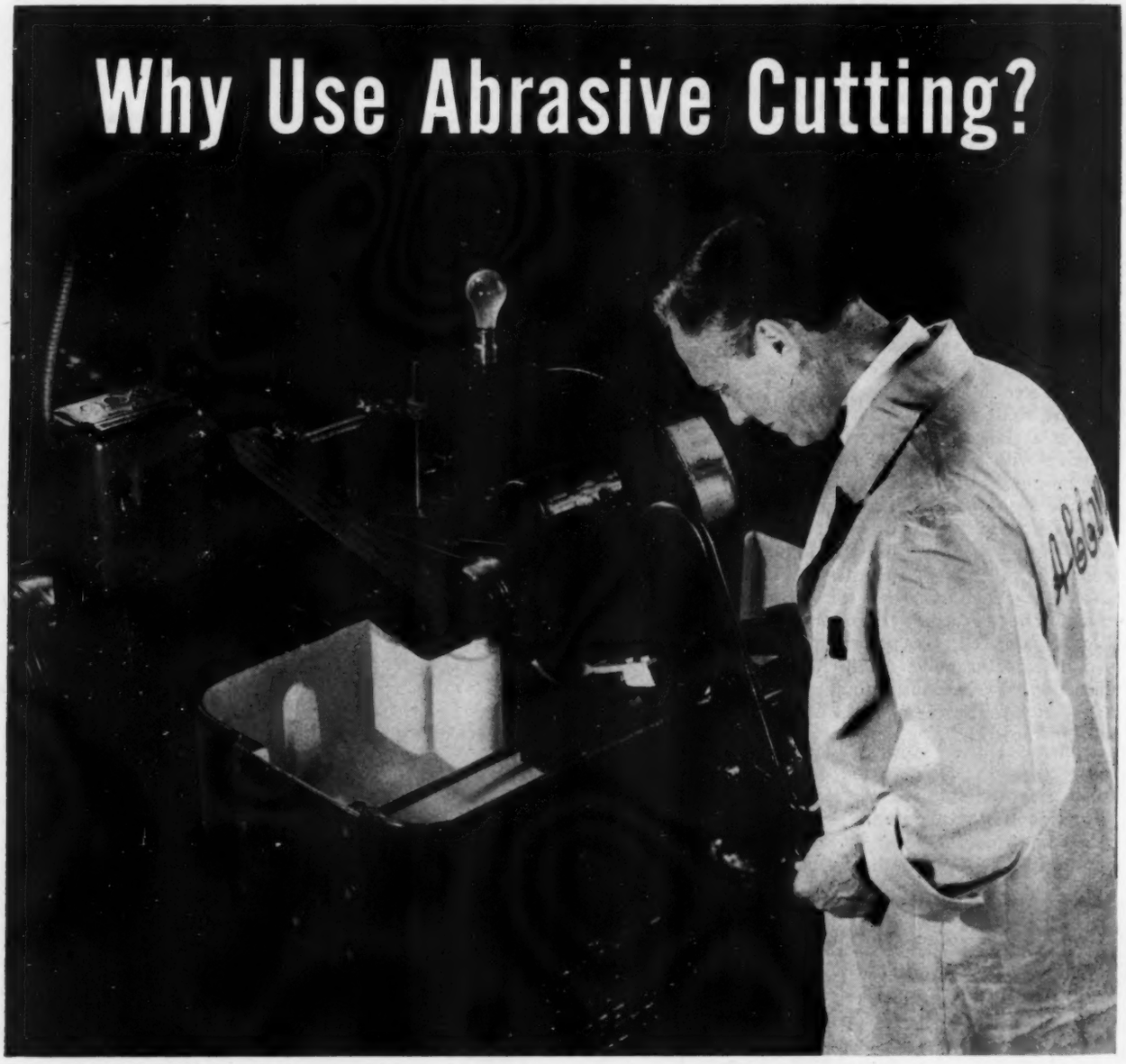


Fig. 1—Water is usually used as a coolant in this wet abrasive cutting machine. The work, as well as that portion of the wheel engaged in cutting, is completely submerged

BY H. G. ROBINSON, ANDREW C. CAMPBELL DIVISION OF AMERICAN CHAIN & CABLE COMPANY

Research in abrasive cutting has made this rapid, accurate process useful for quality work on a wide variety of materials

ABRASIVE CUTTING, as distinguished from abrasive grinding, generally means the complete severance of a piece of material from a bar or length of material. Almost every type of material can be cut abrasively with a great saving in time of cut and with an excellent finish, in many cases eliminating milling or other operations. Whether some types of material can be cut (when quality of cut is not absolutely necessary) as economically as by other means can only be determined by conclusive tests on the latest types of abrasive cutting machines containing features intended to reduce heat, reduce abrasive wheel wear, and improve finish.

An important advantage of abrasive cutting is that pieces can be cut to length within a few thousandths of an inch. Another advantage is that the abrasive wheel will cut without difficulty through any hard spots that may be encountered. Unannealed steel can be cut at the same or at lower cost than annealed steel, and when unannealed material can be used, a saving in material cost of 1 to 2 cents per pound can be realized. Steels of practically all analyses including stainless can be cut off by the abrasive method; other materials used include brass, bronze, monel metal, ceramics, phenolic plastics, glass,

and even tungsten and tantalum carbide. Aluminous oxide wheels are most successful for steel and non-ferrous metals while silicon carbide wheels are ordinarily used for glass, porcelain, phenolic plastics, hard rubber, and similar materials. Diamond impregnated wheels are used for tungsten and tantalum carbide and exceptionally hard natural materials such as Brazilian quartz. Rubber bonded wheels give the best results by the process of wet abrasive cutting on practically all materials. Resin bonded wheels are regularly used on dry abrasive cutting. Abrasive cutting wheels are available as thin as 0.015 in. while the maximum thickness is about $\frac{5}{32}$ in. They are generally used in diameters of from 6 to 20 in.

Dry Cutting Used First

When abrasive cutting was first practiced it was used to overcome the distorition of thin tubing or thin shapes usually caused by ordinary methods of cutting. It was also used for the cutting of hardened materials. Dry cutting was used almost exclusively. With the development of Bakelite or resin-bonded wheels, which gave increased abrasive wheel life over rubber-bonded wheels, real impetus was given the process of abrasive cutting. Machines at that time were of the extremely light variety as it was felt by many users that they would only be used for occasional cutting and not for real production. It became apparent that in order to improve the cutting efficiency of the dry abrasive wheels, they would have to be run at speeds up to 16,000 surface ft. per min. which called for more power. The economical solution to this problem was partly through the design of much heavier and more rigid machines and partly through the development of better Bakelite or resin-bonded cutting wheels. More rigid machines permitted the application of the necessary power and at that point, the abrasive cutting machine began to be used in a limited way for production.

The average abrasive wheel cost of cutting a 1-in. square bar of steel using Bakelite or resin-bonded wheels was about $1\frac{1}{2}$ cents, and the time of cut about 7 sec. Shorter cutting time could be obtained, but only at the sacrifice of abrasive wheel life.

When observed under a microscope, the minute chips obtained in dry abrasive cutting are found to be solidified globules of steel that were apparently in a molten or near-molten condition when they were separated from the material being cut. These chips indicate the high temperature of the material resulting from the action of the fast running wheel. Highest economy can be attained in dry abrasive cutting on most materials only by feeding the wheel into the work just fast enough to prevent the disk from glazing. Too rapid a feed rips out the grits from the bond and does not permit each grit to perform its maximum amount of work. Under ideal conditions of dry abrasive cutting, only about 10 percent of the grit is worn away. At this point, the grit becomes dull and the pressure between it and the work is increased to the breaking point of the bonding material, and the dull grit is torn loose.

Machines of two different types were first developed for cutting bars and flat sheets or plates by the dry abrasive method. With one type of machine, the wheel is fed radially by hand through the bar or rod being cut, while on the other, the wheel is fed horizontally. Both of these machines were designed to provide maximum rigidity to insure a true running abrasive wheel.

An outstanding feature of the dry machines is the complete absence of slide bearings which eliminates bearing trouble due to abrasive dust. In the design of subsequent machines, these principles have been closely followed.

Rubber-bonded wheels are also used in dry cutting, but their use is generally restricted to cutting material of a non-metallic character or extremely thin metallic sections where the generation of heat is at a minimum. The two principal objections to the use of rubber-bonded wheels on dry cutting are excessive wheel wear brought about by softening of the bonding material due to heat, and the odor given off by the wheel due to the rubber bond.

An important deterrent to high-speed production with dry cutting is the fact that even though the abrasive wheel is thoroughly guarded, its speed is so high that the operator is inclined to feel timid about feeding the wheel fast enough. Consequently, the operator does not apply sufficient pressure to prevent the wheel from glazing, and glazed wheels lead to abrasive wheel breakage. On the other hand, if the operator feeds the wheel through the work too fast, the abrasive grains are torn from the bond before they have accomplished their duty of cutting which results in high wheel cost.

Fig. 2 shows a section of a dry cutting machine used primarily for cutting bar type materials. It is extremely im-

Fig. 2—Primarily intended for cutting bar type materials, this dry abrasive cutting machine uses a work holder that is not easily affected by abrasive grit

portant in abrasive cutting of any type to have a work holder that is affected to the least degree by abrasive grit; therefore, workholders or vises of the screw or cam type are not generally successful. On this type of machine, the work should be clamped downwardly or the clamping pressure should be applied in the same direction as the wheel is being fed. If this is not done, the work is inclined to shift slightly when the piece is almost cut off which leads to the cramping of the wheel and, consequently, to wheel breakage.

After the application of dry abrasive cutting to metals, a wide variety of other materials including glass, fire brick, building brick, molded plastics, and similar materials were subjected to cutting tests. It was found that some of these materials could not be cut with the dry high speed abrasive method since contact with the wheel resulted in breakage and shattering of the work. Those materials that could be cut did not have the required finish that was obtained on steel and non-ferrous metals.

Experiments finally indicated the need of a machine in which the heat of the material and the abrasive wheel would be reduced to a minimum. This led to the development of the Hudorkut machine (Fig. 1) in which the work as well as that portion of the abrasive wheel engaged in the actual cutting is completely submerged in a coolant. The first advantage derived from submerged cutting was a reduction in wheel speed from 15,000 to about 6,000 surface ft. per min. It was also found that with the practical elimination of heat, rubber bonded abrasive wheels could be used advantageously. These wheels can be made strong enough to hold the grits in place until they become dull and, at the same time, soft enough to permit the grains to free themselves and be discarded when they have outlasted their usefulness.

When these facts had been proved true for the variety of materials that led to the submerged type of machine, they were found equally true for steel and non-ferrous metals. The finish obtained with submerged abrasive cutting is far superior to that produced by the dry method. Steel pieces cut off by the submerged method are smooth enough to sometimes eliminate finishing operations or to permit deep etching by the metallurgist without any further preparation. This makes this type of machine especially suitable for laboratory work.

Feed Varied Automatically

The Hudorkut machine is provided with a hydraulic arrangement for feeding the abrasive wheel through the material being cut. The feed automatically varies as the abrasive wheel progresses through the material. As the area of contact between the wheel and the work increases toward the center of a round bar, for example, the rate of feed gradually decreases. From the center of the bar to the end of the cut, the feed is increased gradually. The cutoff pieces have a white metal appearance, there being no indication of burning. As heat is eliminated, very little burr is produced. The life of the abrasive wheel in submerged cutting is from three to four times that of a wheel used in dry cutting. This is brought about by maintaining low wheel bond temperature which allows the rubber bond to retain its strength, and thereby its holding ability on the abrasive grits.

On 1 in. octagon shaped chisel steel approximately 500 cuts can be made with a 14 in. rubber bonded wheel. The time of cut is about 10 sec. The higher the carbon content of the steel within certain limits, the more readily it can be cut abrasively. Chisel steel and materials of this type can, therefore, be cut more economically than the lower carbon varieties. Fused quartz 1 in. square can be cut in about 1¼ min. and a 14 in. wheel will make about 150 cuts.

When viewed under a microscope, the chips produced when cutting steel in the submerged abrasive cutting type machine are of a curling white metal type similar to drill or lathe chips. They show no indication of having been heated or burnt and are entirely different from the type of chip produced in dry abrasive cutting. Plain water is generally used as a coolant although soluble oil or soda mixed with water is sometimes used to prevent rusting of work or machine. There is no apparent increase or decrease in the life of the wheel by the use of soluble oil or soda when in the proper proportions, nor is there any apparent difference in the time of cut.

This is the first of a series of three articles on abrasive cutting. The second will appear in an early issue. The machines described in this article are patented.

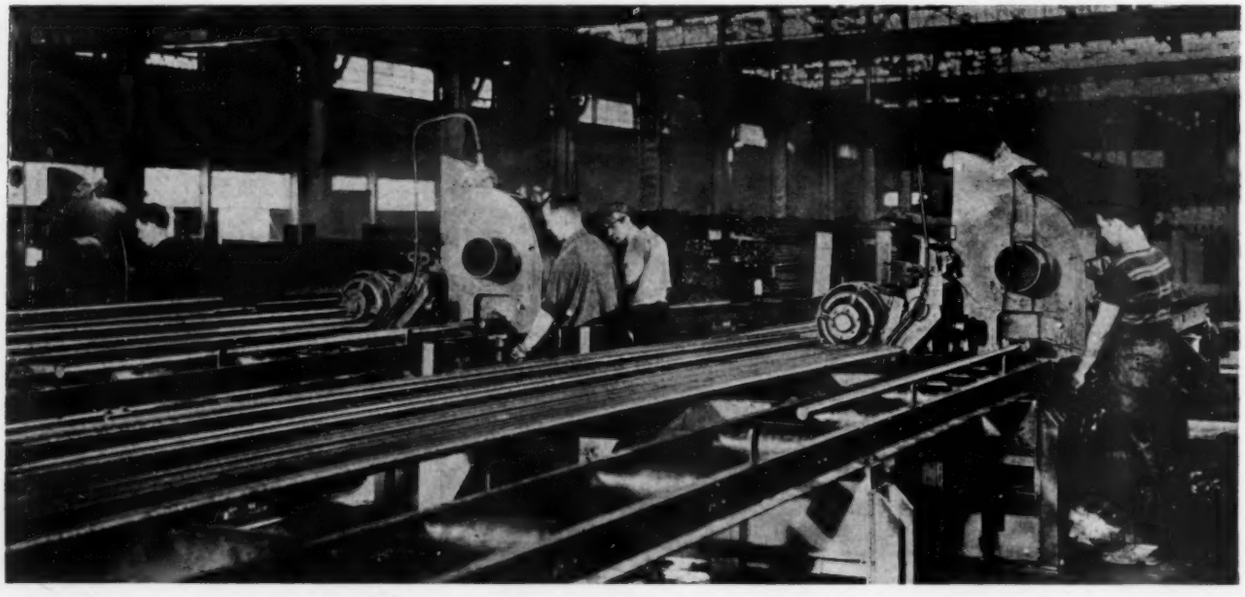


Fig. 3—Three abrasive cutting machines used for cutting off bar stock

The Tool Engineer and National Defense

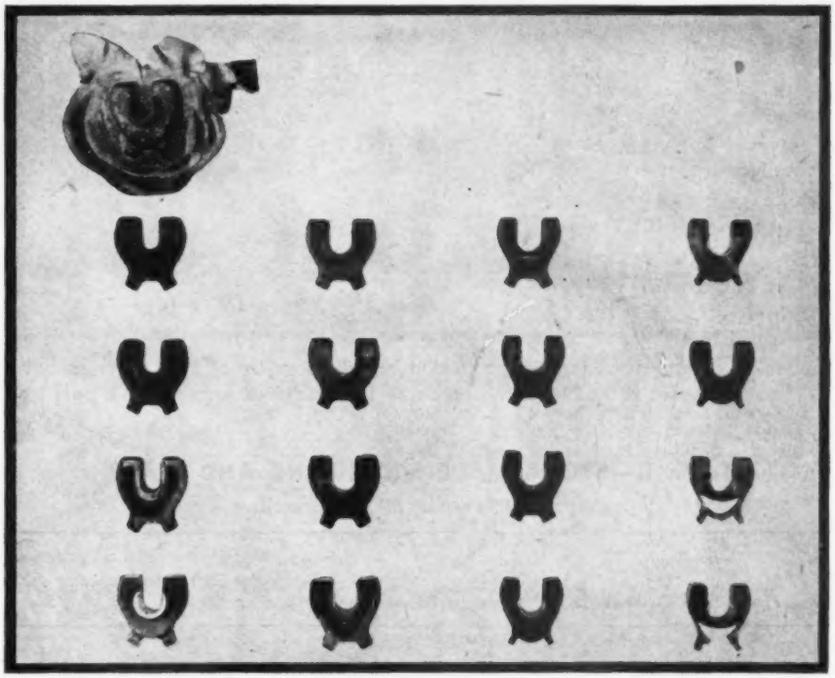
BY I. A. SWIDLO, SENIOR ORDNANCE ENGINEER, SPRINGFIELD ARMORY

The full story of how much the tool engineer is contributing toward winning the battle of production may never be told; examples like these show the way

WHILE THE NATION is engaged in debating where the bottleneck exists in the production of equipment for defense, there is a large group of unknown experts laboring day and night in designing and building tool equipment for the mass production of the implements of war. It is not generally known that the millions of automobiles, radios, telephones, refrigerators, vacuum cleaners, and other devices that make home life easy and pleasant, are the results of much labor and effort by tool engineers. These men are almost unknown to the general public, for their activities have been carried on behind shop walls, over their desks and drafting boards.

Now these same men are engaged in the work of designing and making equipment to produce the implements of war. The colossal task confronting them must be completed in a short period of time. It may be compared with the automotive industry, where an annual changeover usually takes a good year to accomplish. Moreover, in the automotive industry methods and means of production have been highly standardized and developed. The work that tool engineers are doing now amounts to the inventing and constructing of thousands of new fixtures, tools and gages, and hundreds of special machines—a job which would normally require several years.

In 1936 the United States Army adopted a new shoulder weapon, officially known as the United States Rifle, Caliber .30 M1. Today, this rifle is an outstanding example of the utilization of production engineering ingenuity. In the early spring of 1938, a detailed study of new tooling was started. The magnitude of this undertaking may be realized from a statement made by the chief engineer of one of the largest machine tool concerns in the country, who, after a preliminary study of the

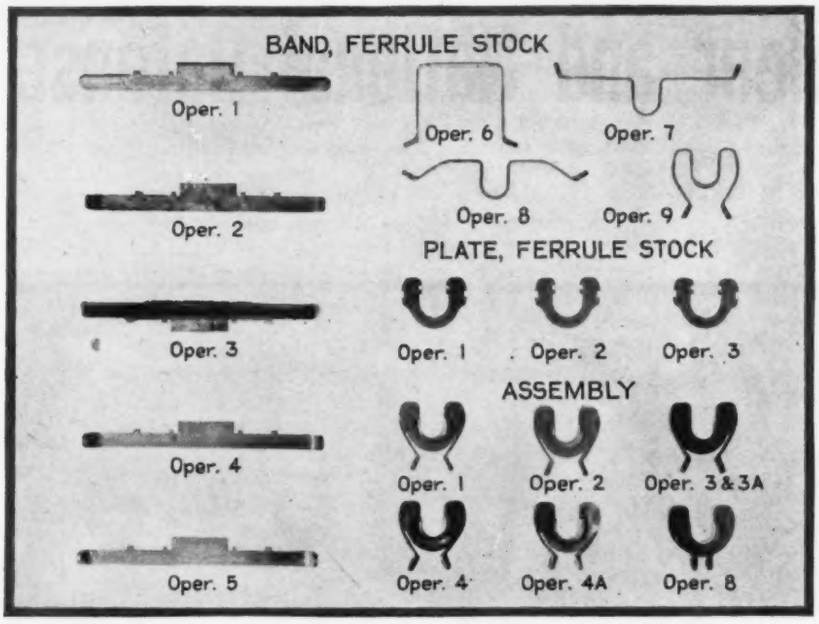


Original design of the stock ferrule called for machining it from a small forging. Nineteen operations were necessary, as outlined in Table I

Table I—STOCK FERRULE MACHINED FROM SOLID FORGING

First Method of Manufacture

Description of Operation	*Type of Machine*	*Net Pcs. Per Hr. Per Mch.*	*No. of Machs. Reqd. for 100 Pcs. Per Hr.*
Forge	800 lb. drop hammer	128	1
Trim	No. 21½ Bliss press	200	1/2
Cold Press	No. 21½ Bliss press	300	1/3
Grind back	18-in. disk grinder	100	1
Grind front	No. 18 Blanchard grinder	300	1/3
Mill center and tap	No. 1–12 in. Cincinnati miller	35	3
Mill radius on corners	Hand miller	55	2
Turn O.D. of boss and face	No. 4 Gisholt turret lathe	20	5
Finish mill top of boss	Hand miller	75	1 1/3
Rough and finish profile inside	Pratt & Whitney profiler	25	4
Form mill both sides	No. 12 Brown & Sharpe miller	25	4
Profile radius around top edge	Pratt & Whitney profiler	50	2
Contour mill one lug	Hand miller	50	2
Contour mill other lug	Hand miller	50	2
Mill inside face of lugs	Hand miller	50	2
Drill, ream, counterbore and tap	5-spindle drill press	34	3
Counterbore outside of one lug	1-spindle drill press	100	1
Profile front top of lugs	Pratt & Whitney profiler	27	4
Cut slot to separate lugs	Hand miller	35	3



Redesign of the stock ferrule, so that it could be made of two parts as outlined in Table II, reduced the machine tool requirements for this part

Table II—STOCK MADE FROM BAND AND PLATE

Improved Method of Manufacture

Description of Operation	*Type of Machine*	*Net Pcs. Per Hr. Per Mch.*	*No. of Machs. Reqd. for 100 Pcs. Per Hr.*
Band			
Blank ⅛×1×5 in.	No. 21 Bliss press	600	1/6
Bend ends	No. 20 Bliss press	300	1/3
Mill serrations	No. 1-18 in. Cincinnati miller	50	2
Shave	No. 19½ Bliss press	300	1/3
Swage lugs	No. 20 Bliss press	300	1/3
Bend " U " shape	No. 21 Bliss press	300	1/3
Bend middle to shape	No. 20 Bliss press	300	1/3
Bend wings	No. 19½ Bliss press	300	1/3
Form to set shape	No. 4½ Bliss press	300	1/3
Plate			
Blank	No. 20 Bliss press	900	1/3
Shave	No. 19½ Bliss press	300	1/3
Swage	No. 20 Bliss press	300	1/3
Ferrule, Assembly			
Assemble and stake lugs	No. 20 Bliss press	200	1/2
Braze	G.E. brazing furnace	200	1/2
Drill, tap, counterbore and hollow mill	Special Kingsbury machine	120	1
Bend to finish form	Greenard press	300	1/3

component drawings, estimated that it would require approximately 20,000-hr. of engineering study to plan the production of this weapon, and an additional 200,000-hr. for tool engineering, design, and the fabrication of tool equipment before beginning production. It should be noted that the time required to build the machine tools needed for this rifle was not included in the above estimate. All of this work now has been completed.

Let us review briefly the task of the tool engineer in this case. His first step was to study each component part and outline the most efficient methods to obtain a given hourly production. In preparing this study, first consideration was given to the question of whether to start machining from bar stock, from a forging, a stamping, a combination of forging and stamping, or a combination of forging and coining. Once the method had been decided upon, process drawings were prepared on which the machine cuts were shown in sequence, allowable tolerances established, and locating points indicated.

These process drawings were reviewed by the production engineering staff and the selection of machines, as to type and size required for each operation, was made. In this review of methods, a final study was made as to the practicability of combining cuts and of the availability of standard tools. In a great many cases it was found to be economical to combine several cuts and perform them on special machines. The rough designs of such machines were worked out at this time.

In adopting specific methods, the tool engineers have had to design fixtures, jigs, cutters and gages, in such a manner that they will be as simple as possible to make, and easy and quick to operate. Since there are more than 1,100 machining operations on the semi-automatic rifle, and each requires a machine, a fixture or jig, one or more cutters, and one or more gages, the tool engineer has had to do a considerable amount of inventing and designing.

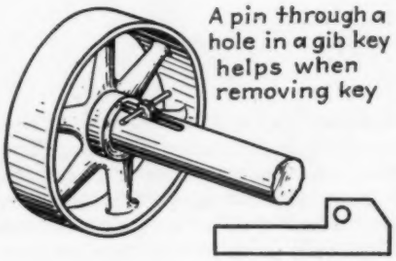
The original design of a component part of any mechanism usually prescribes the way in which it should be made, and the tool engineer in most cases has no alternative but to process the part in the manner so indicated. However, he need not be silent in this matter if he sees that a change from the original design will result in simplification of the manufacturing procedure.

The best example of an accomplishment in this field of the tool engineer's work, as it applies to the semi-automatic rifle, is in the production of the stock ferrule. The original design of this component required that it be machined from a solid piece, and the tool engineer in order to comply with the design, laid out the method and tooled up to begin machining from a forging. A restudy of the component indicated that it would be better to produce it in several parts which could be fastened together by means of copper brazing.

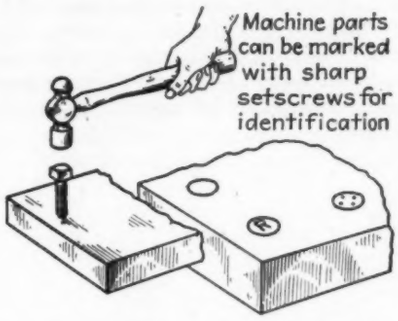
The new method requires only eight punch presses, two power milling machines, one copper brazing furnace, and a special multiple counter-boring and tapping machine. The total cost for this equipment, including twelve dies and two milling fixtures, is only one-third of the cost of the equipment necessary to produce component in one piece from forging. This equipment is more productive and requires only part of the original crew; there was a saving in direct labor of approximately 68 percent.

SHORT CUTS FOR THE SMALL SHOP

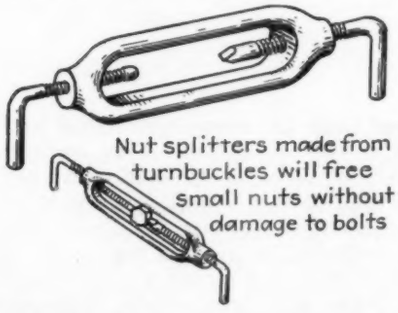
BY A. H. WAYCHOFF



A GIB KEY can be romeved easily from a shaft if a hole is drilled through its head. Such a hole should be drilled before keying the pulley on the shaft. Furthermore, the hole should be set well toward the inside or key side of the head as shown in the drawing. When necessary to remove the key, a short steel pin can be inserted in the hole—this serves as a bearing for a small pinch bar or wedge.

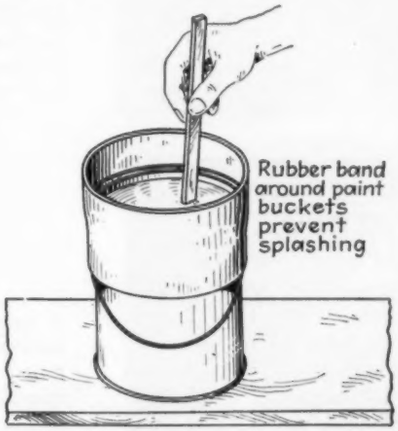


RING STAMPS made from setscrews are useful to identify parts when dismantling machines, and can be used in place of a sharp center punch frequently employed for that purpose. If letter or numerical stamps, as well as groups of prick punch marks, are needed to identify the machine parts for reassembly, these can be ringed with the sharp rim on the cup end of setscrews. This practice helps to distinguish new identification marks from ones placed on the machine parts at earlier dates.

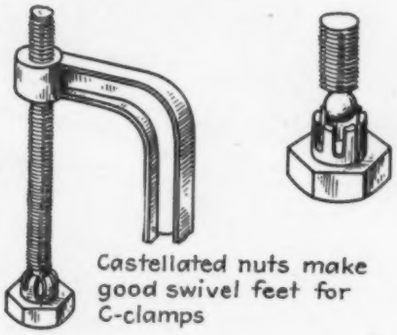


FROZEN NUTS are removed with difficulty, and often must be split before they can be unscrewed. If a hammer and chisel are used to split the nut, lack of support may damage the part held by the bolt. This may be avoided by making a nut splitter from a turnbuckle, one end of which is sharpened to a chisel point, while the other end is rounded. Tightening the rounded end, after the chisel end is brought against the nut, will split small nuts without damaging the part held by the bolt.

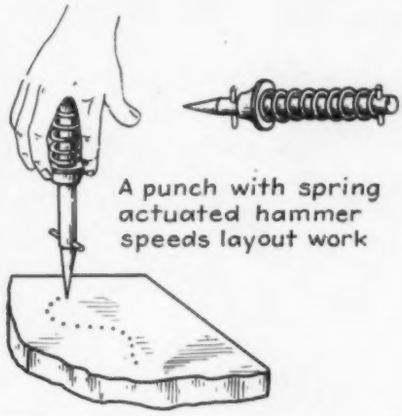
ANGLE IRON bench ends are not only decorative and reinforce the bench, but can be used for cutting sheet metal, small rods, wire, and wire netting. The corner of the angle iron can be sharpened with a file, and will hold its edge for a long time. It is always ready for use—many cutting jobs can be done more quickly and smoothly than with either a hammer and chisel or snips.



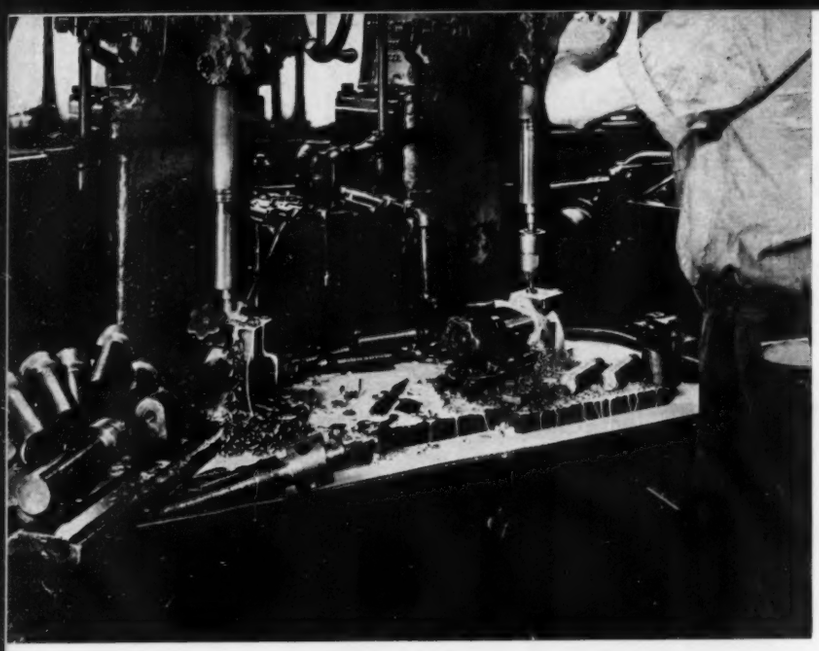
SHOP PAINTERS must frequently stir paint in buckets or newly opened cans. Splashing and spilling the paint over the can and on the floor is the inevitable result. This can be prevented by cutting a piece of rubber 3 or 4 in. wide and stretching it around the top of the bucket.



CASTELLATED NUTS can be used to replace broken or worn out swivel feet commonly found on C-clamps. Take the nut, bore out the threads from the castellated portion, and then turn down the prongs to half their thickness. Screw a bolt into the remaining threads, and cut it off flush with the bottom of the nut—it can be secured by center punch marks at the periphery of the threads. Finally, slip the nut over the ball end of the C-clamp screw and bend the castellated prongs slightly so that the nut is free to turn.

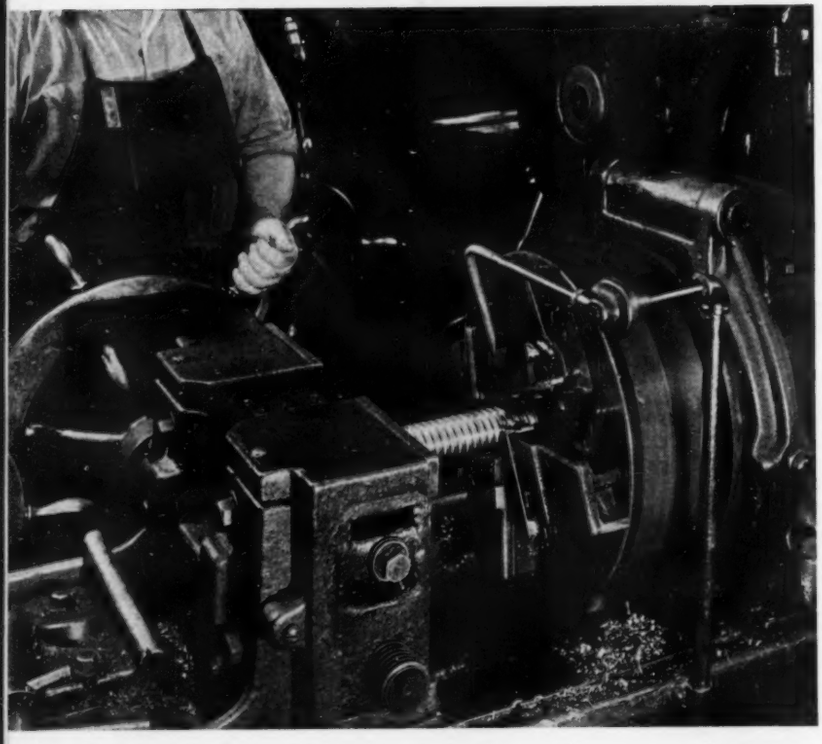


PRICK PUNCHES that can be operated with one hand are handy tools. One such punch can be made easily by placing a spring actuated hammer directly on the punch itself. Take a piece of ¾-in. steel and, after grinding the point, drill a hole adjacent to the taper for inserting a piece of ¼-in. drill rod. A hammer of inverted bell shape is next turned and bored to slide on the ¾-in. punch and rest against the drill rod. When the hammer is backed up by an open coil spring, just stiff enough to be compressed with the fingers, and held in place by a second piece of drill rod near the top of the punch, you have a punch that can be operated with one hand. The hammer can be raised with the fingers. When released, it will strike the bottom drill rod with sufficient force to make punch marks in sheet metal and steel plate.



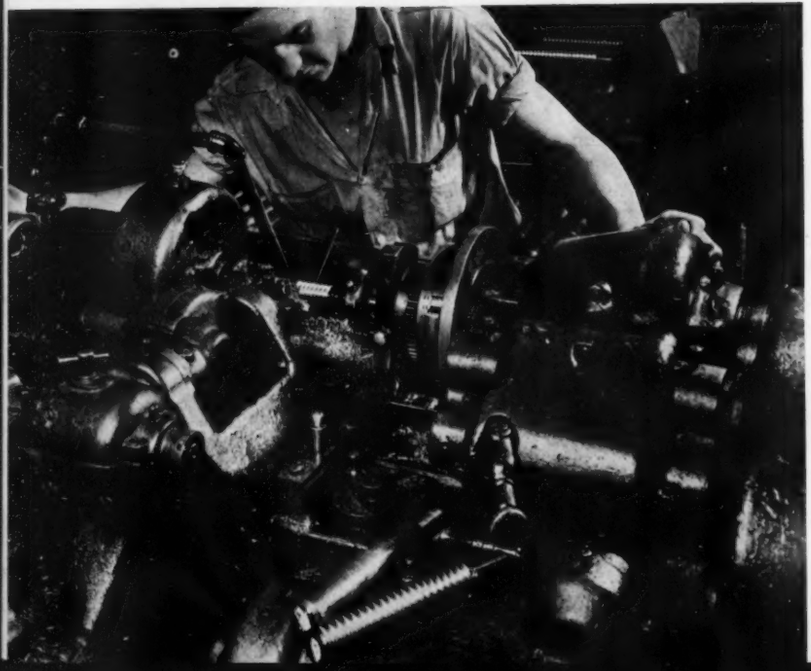
Good Tooling

SCORES OF INDUSTRIES make use of various types of jacks, many of them in large quantities. Templeton, Kenly & Company, has a large well-equipped plant devoted to jack manufacture. They produce over 200 different models of screw, lever and hydraulic jacks. All of these are made under exacting control and all are tested to 50 percent overload before shipment.



The screw for a 2-in. ball-bearing locomotive screw jack (above left) is made from an SAE 1120 steel forging. The head of the forging is machined in a single setting on a Fay automatic which turns three diameters and cuts two grooves. The head is cross-drilled on two diameters using the simple fixture under the left spindle of the Barnes drill illustrated. Production is at the rate of 22 pieces an hour. The same operator performs similar operations on another part with the other spindle

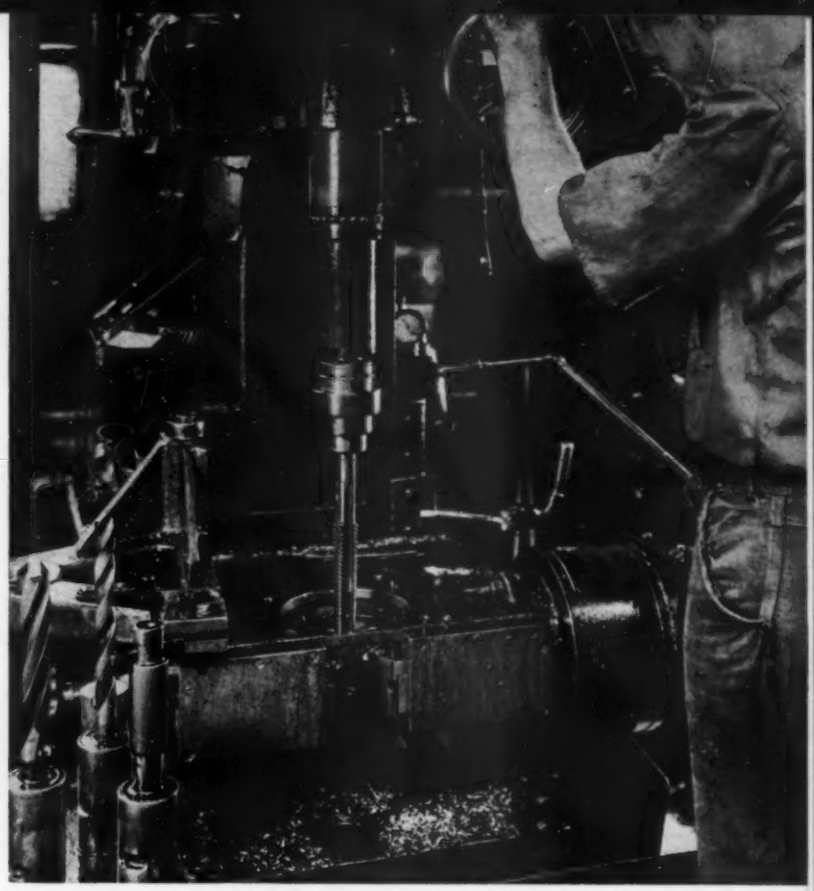
Threading the stem of the forging shown in the first illustration is done in a Landis thread chaser which cuts a 2½-in. pitch Acme thread on 30 to 35 pieces an hour. Since the dies, which are opened and closed by a hand wheel, have to be tapered to start the thread, it is necessary to rechase the thread and finish its inner end on a second Landis machine equipped with dies which have no taper



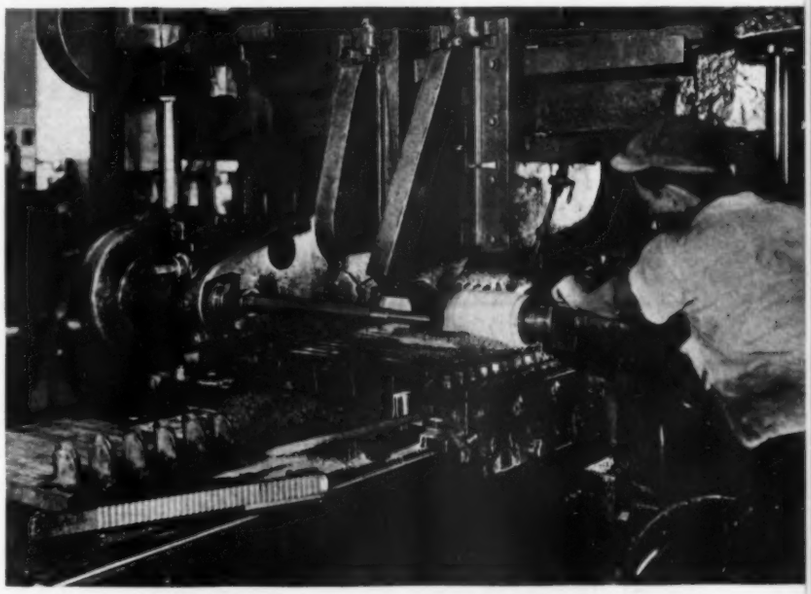
A journal jack has screws which have to be hardened to 340–367 Brinell. They are made from SAE 4150 chrome-molybdenum steel, quenched in oil at 1550 F. and drawn at 850 F. to produce the required hardness. This is done prior to machining to avoid distortion of the thread. The thread is milled in a 14-in. Pratt & Whitney thread mill, using a 3-in. high-speed steel cutter turning at 75 r.p.m. and Stuart thread-cutting lubricant. Because of the hardness of the work the cutter has to be reground every four or five pieces

Speeds Jacks

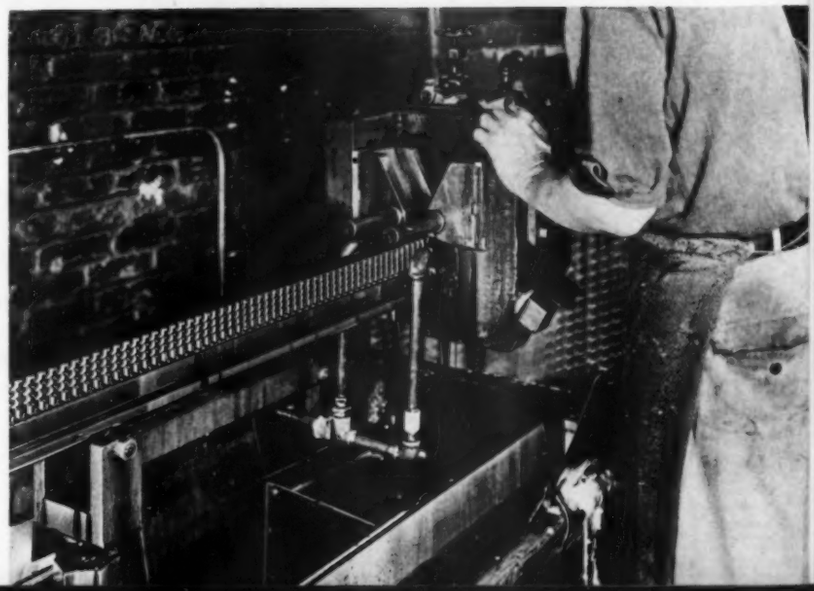
The plant includes a well organized heat-treating department; practically all jack parts, whether hardened or not, are tested for hardness to make sure that the specifications are met. Parts for most models are produced in sufficient quantities to warrant a good job of tooling. The illustrations on these pages show operations upon a representative selection of parts.



A typical nut is made from 2½-in. lengths of bar steel 2⅛ in. in dia. The entire job is done in one setting of the piece and 18 to 20 nuts an hour are produced in this Baker drill press. First a 1 7/32-in. hole is drilled through the piece. This is enlarged by a second drill to 1¼ in. The nut is faced with a fly cutter piloted in the hole and the hole is tapped in the fourth operation. An air operated chuck holds the work and a swinging fixture holds the bushings to guide the drills. The tools are held in a quick-operating chuck



Racks for lever type jacks are forged from SAE 6130 steel and then annealed. Rack teeth are machined in an Ingersoll miller. A dozen or more pieces are clamped in the fixture for gang milling. The racks illustrated have 35 teeth 9/32 in. deep and are produced in a single pass of a high speed cutter driven at 31 r.p.m. The cutting traverse requires 27 min. and the operator has time to load a second fixture while the cut is in progress.



Drop forged pawls used to mesh with the teeth of racks have their teeth produced by broaching on Lapointe broaching machines. Prior to broaching the pivot holes are drilled in the pawls and these are used for locating in the fixture. The broach is 60 in. long and has 87 teeth on a side. The time required is 45 sec. per stroke. About 0.009 in. of metal is removed in making a cut which is smoother than one produced by milling

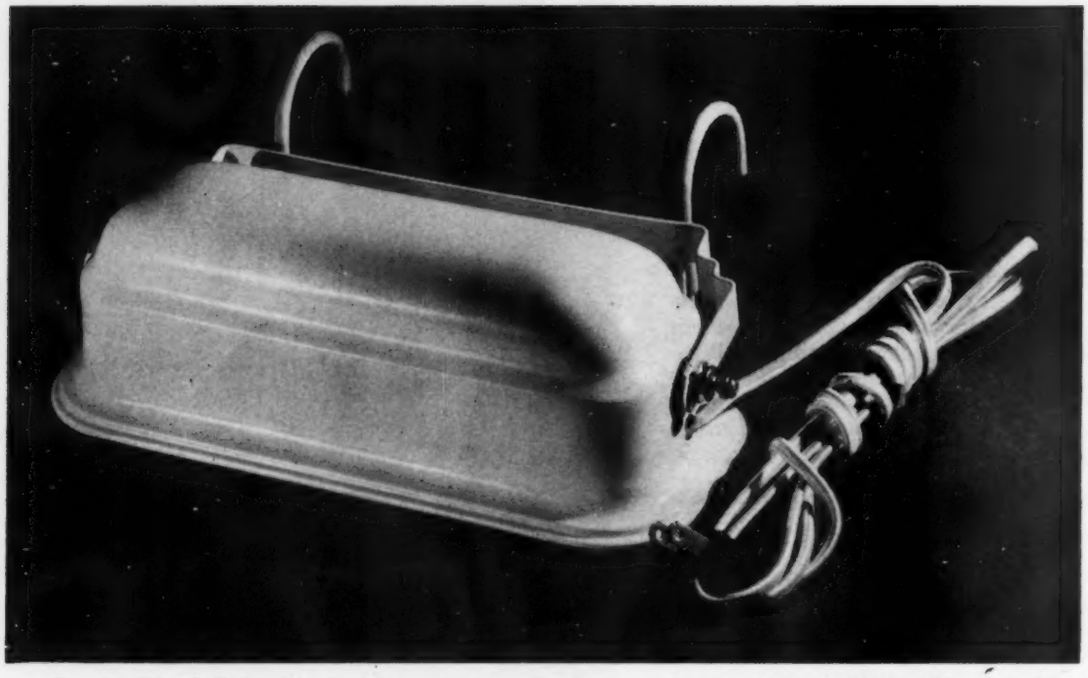


Fig. 1—The shell for this bed lamp is drawn in two steps from a sheet of 0.020 in. thick steel

Draw Dies for a Rectangular Shell

BY MARK GOLDEN

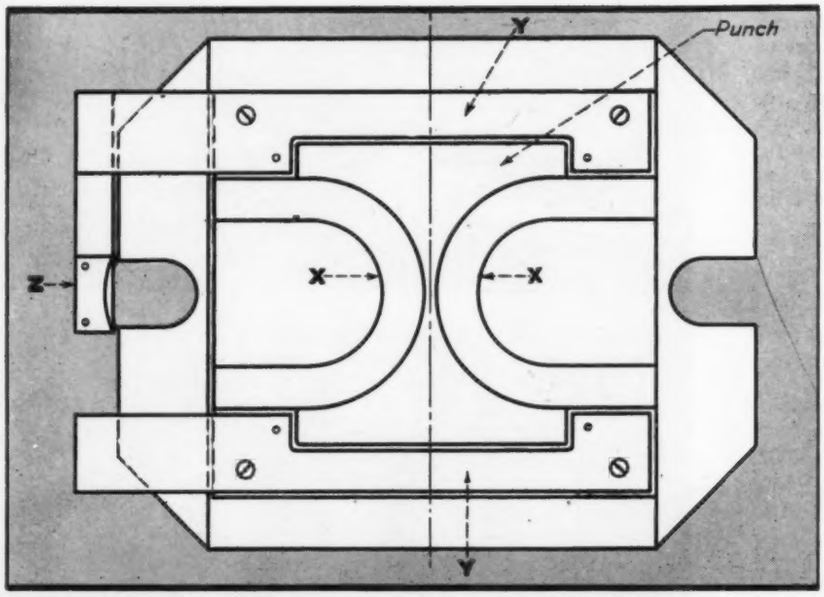


Fig. 3—The blanking die incorporates two forged tool steel cutting edges, *X*, two guide bars, *Y*, and a stop, *Z*. The punch has heels at both ends which enter the die before the metal is cut. This die produces little scrap and is less expensive than a forged blanking die

Dies for drawing, flanging and curling a rectangular shell require careful attention if wrinkles are to be prevented

ONE OF THE most difficult shapes to draw, especially from the viewpoint of the die designer and die maker, is the rectangular shell. This is due to the metal being drawn at the ends while the sides are simply bent or formed, as in a bending die. Properly arranging the draw die to suit both conditions complicates the designer's problem.

A typical example of this type of work is the shell for the bed lamp shown in Fig. 1. The shell requires two draw press operations, as well as a trimming, a flange forming, and a curling operation. The work was made more difficult by the requirement that the shell be made from light-gage steel.

The 9x11$\frac{7}{8}$-in. blank, shown at *A* in Fig. 2, is cut from sheets 9 in. wide in the die shown in Fig. 3. The ends of

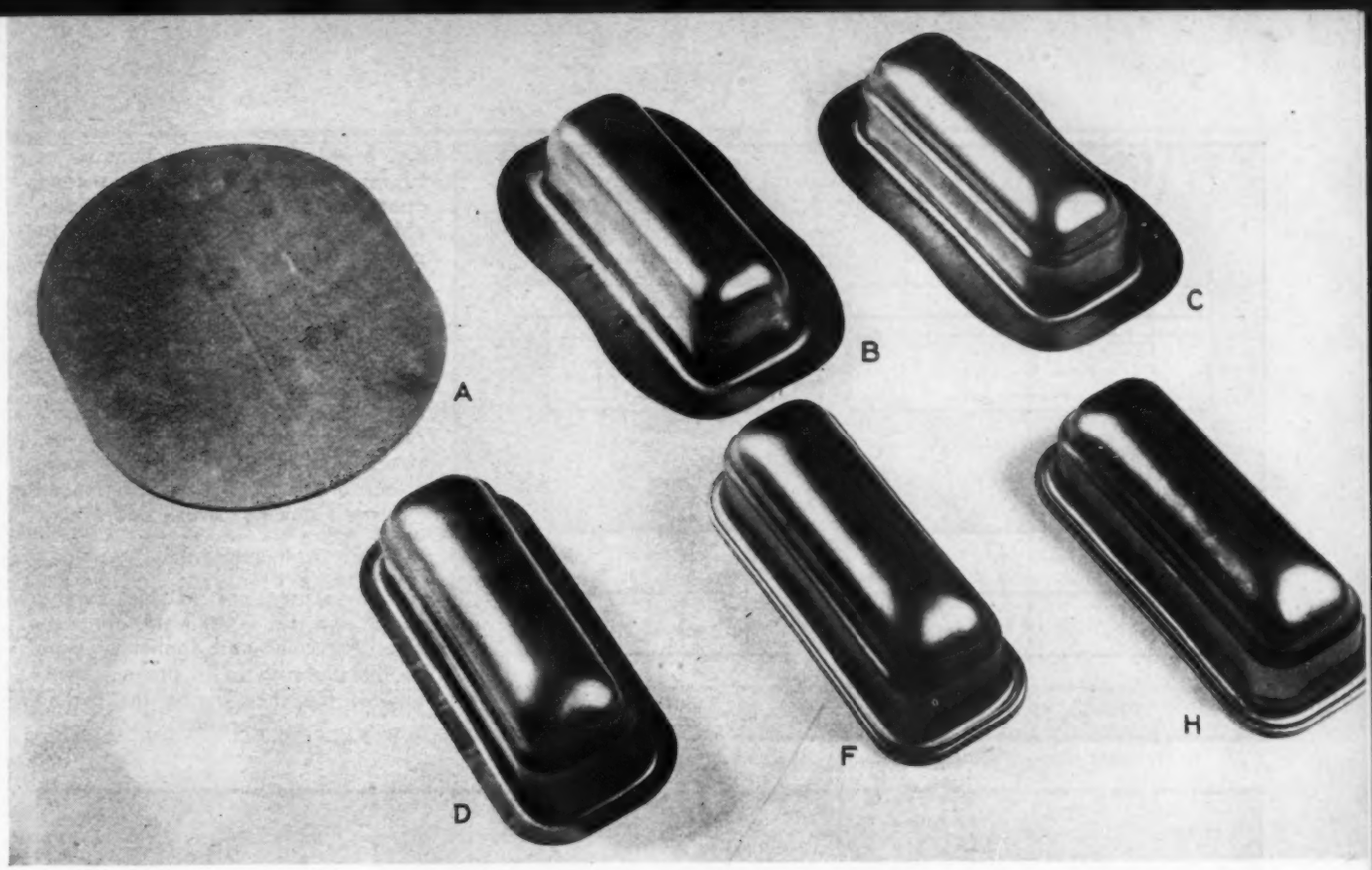


Fig. 2—The Blank *A* is drawn, as at *B*, then redrawn in a second die, as at *C*. This drawn shell then is trimmed, *D*, flanged, *F*, and curled, *H*, so that the curled edge will retain a 0.105 in. wire loop.

this blank have a radius of $4\frac{1}{2}$ in. Made from two forgings, *X*, of oil hardening steel, this die has two oil-hardening steel side pieces, *Y*, and a stop *Z*, to control the length of the blank. The punch has heels at both ends to enter the die before the cutting action takes place. Guide strips *Y* center the sheet in the die. This form of construction costs less than a forged blanking die and there is less scrap in production.

Both the die and blank holder of the first-operation drawing die, Fig. 4, are of cast iron and have hardened and ground tool steel faces. To eliminate breakage at the ends of the shell, and to increase pressure at the sides, the face of the die was ground at a slight angle, as shown by the dotted line, so that the die face was 0.005 in. lower at the ends than at the center. Corners of the die opening have a $\frac{3}{4}$-in. radius, while the drawing edge of the die has a radius of $\frac{1}{2}$ in. The cast iron punch has a $1\frac{3}{8}$-8 threaded hole for attachment to the inner ram of the draw press. Shells drawn by this die are $2\frac{3}{4}$ in. wide and $8\frac{1}{4}$ in. long, and have a depth of $2\frac{9}{16}$ in. One of these shells is shown at *B* in Fig. 2.

The second draw press operation finish forms the body of the shell in the die shown in Fig. 5. Made of cast iron, this die is in two sections to facilitate machining. The shell as drawn in the first operation fits into the second die and, under pressure from the blank holder on the flange, is drawn to a depth of $2\frac{7}{8}$ in.

There is very little stretch of the metal in this operation, which really is a re-forming operation, but considerable pressure must be applied to the flange or the straight sides of the shell will wrinkle. The drawing edge of the die is polished and has a radius of $\frac{3}{8}$ in. The shell as it leaves the die is shown at *C* in Fig. 2.

Next, the shell is trimmed, as at *D* in Fig. 2, in a die made from a machine forging having a tool steel cutting edge welded in place. The punch for this die has a tool steel forging fastened to

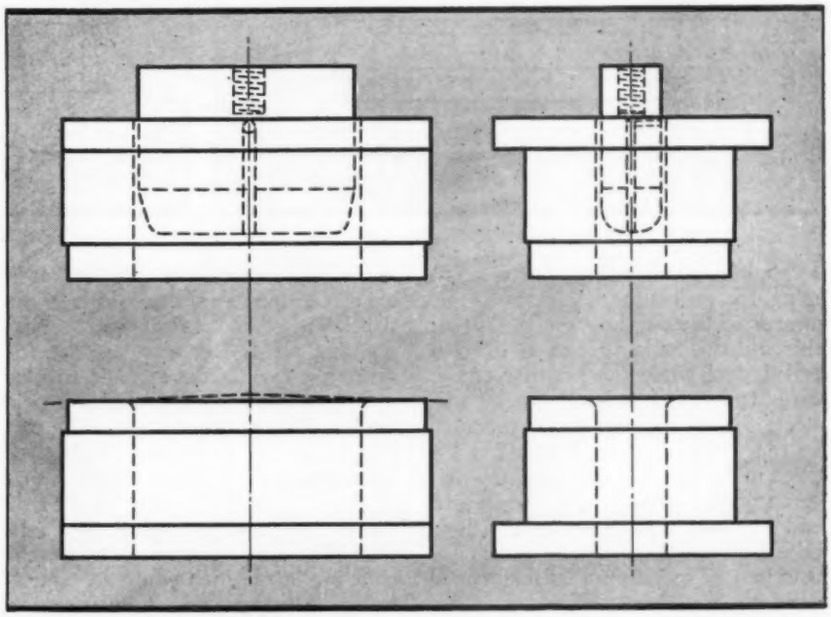


Fig. 4—Hardened tool steel faces are fitted to the cast iron die and blank holder of the first draw die. The top of the die is ground at a slight angle, see dotted line, so the ends are 0.005 in. lower than the center

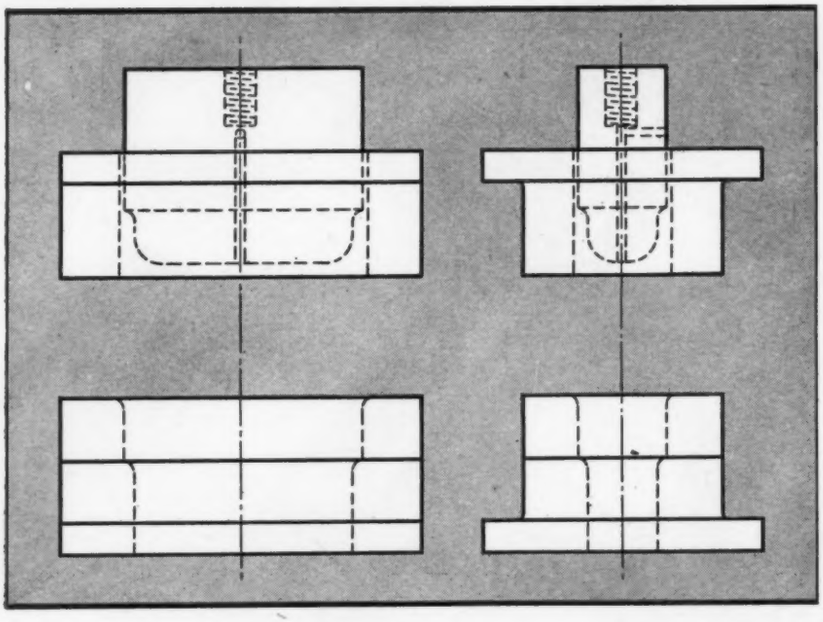
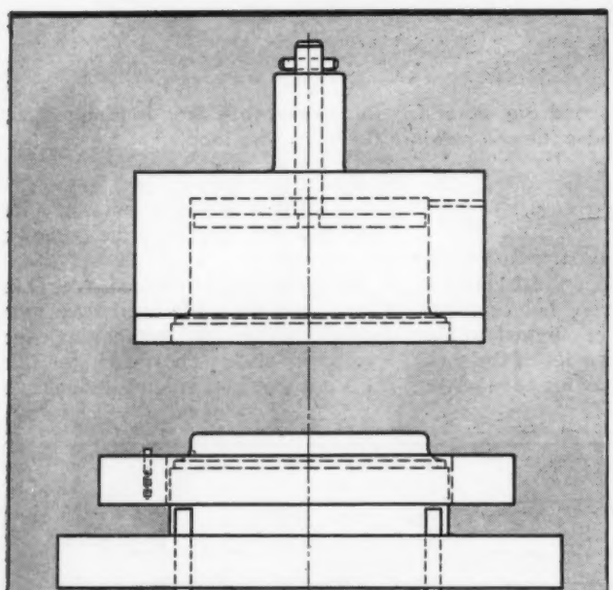
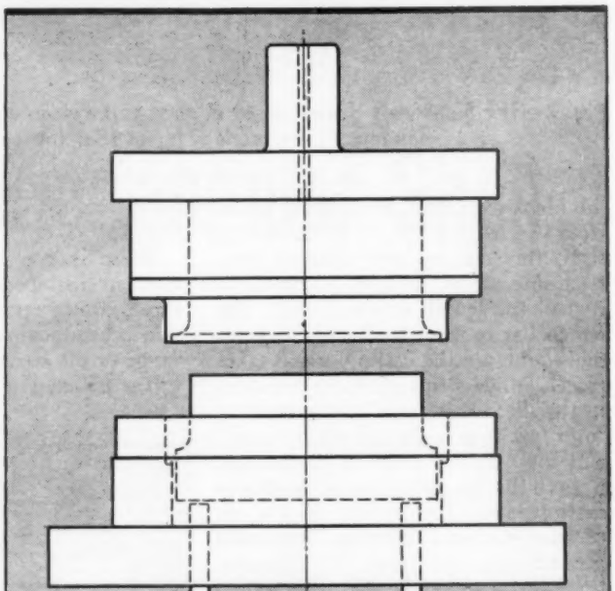


Fig. 5—Made in two sections so as to facilitate machining, the second operation draw die applies considerable pressure on the flange so as to prevent wrinkles in the straight sides of the shell

Fig. 6—The flanging die, lower left, uses a rubber spring barrel to apply pressure to the pad. Clearance between plug and punch must be maintained or trouble will be experienced in the following curling operation

Fig. 7—Dimensions of the curling punch and die, lower right, are critical. A rubber pad applies pressure to the plate so as to prevent buckling of the shell during the curling operation





a cast iron punch holder. After trimming, the shell is formed on the flange, as at *F*, in the die shown in Fig. 6. In this die the flanging pad is of cold rolled steel while the pressure pad is made from hardened and ground tool steel. Six spring pins locate the shell by the trimmed edge. Pressure is applied to the pad by a rubber spring barrel through four pins. The punch is of cast iron with a tool steel face. Allowance between the plug and punch for thickness of metal must be maintained carefully.

The curling die shown in Fig. 7 must be machined carefully. It is made from two forced tool steel rings. The upper ring is machined and filed to a templet of the size of the outside of the shell. The procedure followed in making this die is the same as that for making a curling die for non-circular trays described in a previous article (*AM*—Vol. 82, page 419). The cast iron punch has a tool steel forging for the working edge. This forging is machined to a close fit in the top ring of the die. Pressure is applied by a rubber pad to the pressure plate to prevent buckling of the shell while the edge is being curled sufficiently to retain a 0.105-in. diameter wire. In the lamp shade, this wire is used to retain a sheet of frosted glass.

Goggle-Eyed Switches

BY ED WEST

We thought we knew all the tricks there are on getting men to wear their goggles while working with the grinding wheel. We saw one which was new to us last week in a shop that makes switches. The goggles are kept at the grinder which is so connected that it cannot be turned on until the goggles have been removed from a special holder. Of course, the operator could put the goggles in his pocket if it weren't just as easy to put them over his eyes where they belong.

"Ten Silver Months . . ."

"EVERY WEAPON *we make today is worth ten that we might produce next year; for this year – 1942 – is the critical year in the existence of the United States.*"

This grim challenge was thrown at American industry by Donald Nelson in his first speech as chief of the War Production Board. He was speaking to a group of business paper editors, called together to receive at first hand Mr. Nelson's urgent message to the industries they serve.

"We've wasted the golden months", he declared, "the months in which we could have expanded our steel industry, our chemical industry, our copper industry, and all the others, so that we would have plenty of everything. But we still have ten silver months – the months that remain in 1942–and in them we can do things that we never thought possible."

To that objective Mr. Nelson has dedicated his high talents and boundless energy. And to that task he asks American industry to apply the full measure of its resources and skill.

That challenge should be all that it takes to exact from industry the last ounce of its energies. For by now we all can see that in this war the American way of life is at stake. American industry is the essence of the American way of life. Neither can survive without the other. So, even if it had no better reason, industry must go all out to win this war as a measure of self-preservation. Here self-interest and patriotic duty are synonymous. American industry cannot afford to let America lose this war.

The 1942 job is crucial. If it is well done we have a chance to win. If it is badly done we cannot possibly win. There is the measure of the responsibility that now rests upon the shoulders of industrial management.

It is not just Donald Nelson who asks this of industry. He speaks for the millions of fighting men – on land, at sea, in the air – the world over, whose eyes turn so desperately to the workshops of America. There and there alone can they see the hope of victory.

The people of America are not going to let those men down. They demand of industry every effort and every sacrifice that may be necessary to back them up. On that score, American industry stands, of necessity, on trial before our people. It must come through – or else!

* * *

As industry goes all out to meet this demand, its management asks of those who set its tasks and supervise its performance the utmost possible cooperation. It asks of them specifically an understanding of its problems and a chance to work them out without unnecessary interference. It asks for protection against attack from the rear while it concentrates its energies against the common foe. It asks a truce on economic reforms and social experiments that have nothing to do with winning the war and that are bound to arouse misgiving and mistrust amongst the proprietors of industry. Above all, it asks that it be not made a political scapegoat for every deficiency that is sure to develop in the confusion of a war effort.

This does not mean that industry resents honest criticism or constructive direction. Neither does it mean that it is unwilling to do its best unless it can have its own way in all things. The managers of industry are practical men. They know better than anyone else that unprecedented conditions call for new methods, that they must be open-minded to every criticism sincerely directed toward winning the victory. They know that no one can afford to be smug in the face of a national crisis.

There would be no point to my rehearsing here the pros and cons of such criticisms. Time is too short for that. Only in its performance can industry write a convincing answer to its critics. But as a help toward the achievement of that performance, I should like to clear up, if I can, one prolific source of misunderstanding and mistrust.

I refer to the solicitude of industrial managers as to where their companies may find themselves after the war. *This concern for the future sometimes is misinterpreted to mean that management is blind to the urgency of the present. But it does not mean that. It is a perfectly natural anxiety that must be felt by any responsible management operating under the American enterprise system – which is one of the things we are fighting to preserve.*

Under our system, the managers of industry cannot but feel a sense of responsibility to its owners, not merely for current dividends on their investments but also for the conservation of their properties That means they must feel some concern over what may happen after the war to a business that now must go all out to help win the war. And their concern is but part of a general concern over what may be the effect of the war on the whole American way of life, preservation of which is our reason for being at war.

To give practical effect to that concern under present conditions is one of the problems of management. It is not an insuperable problem. Competent management will be able to surmount it, I am sure. But the right kind of help from those in authority can make the job a lot easier. And let us note in passing that the problem cannot be written off, as some critics of business seem to think, merely by setting off against it the profits that business can make on war contracts. That misses the whole point.

For a business enterprise is not, as many seem to think, just a "profit-machine." It is not set up and operated by its owners and managers for the sake of this month's or this year's profits, without regard to any other consideration.

The fact is that any worth-while business must operate as a going concern. It consists not only of stockholders and managers, but also of employees, markets, distributors, and dealers. Mostly, I might say, of markets, distributors, and dealers. They are the "reason for being" of any business, the source of its payrolls and its profits.

No competent management wants to scrap such essential elements of its business just for the sake of war-bred profits, however large they might look . . . at the moment. Most of the original reluctance to get into arms production, for which industry has been criticized, was not due to a "greed for profits", as has been charged. Rather did it arise from management's mistrust of "war profits" that can be made only by sacrificing the essential elements of a healthy business.

* * *

But now industry faces a dire national emergency. The survival of our country and all its institutions – including American business–is at stake. So management must shape its course to meet without stint every need of the war

effort. That means it must subordinate to that effort every other concern. To lose the war is to lose all. We must first win the war if we would save anything.

To the men of management that presents a grave responsibility. It is fair to ask whether government can do anything to help them meet it. One simple thing I think government can and should do. It cannot dissolve all the concerns of management, but it can help substantially.

Government should do all it can to help management conserve those assets of business that will contribute to post-war reconstruction, when that can be done without prejudice to getting on with the war.

Let me explain. Broadly speaking, every business comprises three elements. One is its tangible assets — its factories, machinery, equipment, and materials. Another is its productive capacity — its management, organization, trained working force. A third is its intangible assets — the goodwill, familiarity, acceptance, and recognition that it enjoys amongst its dealers, customers, and prospective customers.

When the nation goes to war government becomes the one dominant customer of a business. Of these three elements, the first two — plant facilities and organization — become of paramount importance to the job in hand. But so far as the government buyer is concerned, the third drops to minor importance.

But that third element cannot be ignored by the managers responsible for that business. For it will be their mainstay when they must rebuild that business after the war, when government has lost all interest in its existence, except as a source of tax revenue. That is why government can help greatly if now, during the war, it recognizes the legitimate concern of management to conserve those assets that will be essential to survival after the war.

Everyone recognizes the obligation of government to demand that the individual business go all out for war production, to forbid the production of goods not essential to wage war and to commandeer those that are, to require that a business sacrifice its markets and disrupt its distribution organization. No one questions the right of government to restrict arbitrarily the amount of earnings that a business may retain as profit from its war activities. In short, no one questions the right of government to become the dominant partner in any business that may be needed to win the war and, as dominant partner, to put the national need above any conflicting interest of the business.

But, as it does all this, government should remember that the survival of that business is staked on the public's knowledge and use of those discontinued or commandeered products, on the stability of that crippled dealer organization, on the ability of the business to maintain its standing in a market-place from which, temporarily, it may be barred.

And government can help management to deal with the exacting task it now faces, if it will do all it can to avert the needless sacrifice of business interests that do not conflict with war needs, if it will but remember that one of these days, that business again will be on its own, gathering up whatever resources it may have left, recreating its markets, rebuilding its distribution channels, reestablishing itself as a going concern . . . and doing all this in a competitive world without benefit of war orders.

The only foundation upon which any business can hope to rebuild when that day comes is its customers' memory of its name and their understanding of its products. Whatever credit may be coming to it for its war effort will not avail it very much if it permits itself to be forgotten. Its chief assets in that day will be the identity, recognition, and acceptance it still enjoys amongst those to whom it must look for business.

That is why so many business men, already going all out on their war jobs, become apprehensive whenever some word or act of a legislator or government official seems to question the validity of their sales, promotion, and advertising activities during the war. For they know that it is by such measures alone that any management can hope to conserve — while its business goes to war — the values it will need when it returns to civilian service.

That is why I ask government to do all it can to allay such uncertainties, to reassure business of its desire to help conserve those intangible assets that mean so much to business security. For that, I believe, will strengthen the hand of management in a big way as it goes all out on the vital job Donald Nelson has staked out for industry.

* * *

He has told us that if we are to make these ten silver months productive enough to make up for the golden months that are gone, industry must do things it never thought it could do. That is dead right. For America now finds itself in a position it never thought it could be in.

All too slowly, but very surely, it is dawning upon us that this is OUR WAR. Moreover it was our war long before we knew it or did much about it. So our job today is not merely to match the current production of our enemies. That is not enough. We must produce also enough to match the surplus of resources they had built up before we got started. We must produce enough not only for our own needs, but also for all the United Nations.

Moreover we must produce all that we need for decisive victory, for anything short of that will mean defeat. If we would save the American way of life, we must destroy once and for all the forces that threaten it. A stalemate would mean but an armed truce and what that might do to the American way of life and to American industry no one dares to guess. Victory must mean decisive victory. And this, very definitely is our war.

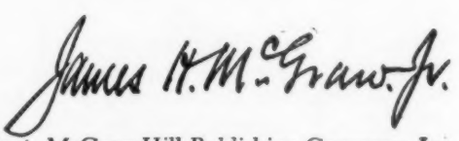
And just as definitely, this is OUR YEAR. For in this year — 1942 — we must prevent our enemies from achieving an advantage that might put victory forever beyond our reach — despite all our vast resources. It is an appalling fact that victory may slip beyond our grasp — not in 1943 or in 1944 — but during the months just ahead of us.

"Industry's responsibility in all of this is great," says Donald Nelson. "The job will take brains and initiative, but we can do it if we go out with a will."

To Mr. Nelson, that initiative means that industry must lead rather than follow in the march to more intensive use of our machines and our man-power. We dare not wait for new facilities to meet our mounting needs. More and more we must press for more widespread subcontracting and conversion. And he is counting on that initiative, backed by ever more aggressive effort, to avert or to minimize the compulsory measures that now seem imminent.

"We must stop thinking about what we're going to do to the enemy in 1943 and start thinking of what we're going to do to him in March of 1942.We must make today the things we would be making next year . . . if we had the time to spare."

That, says Donald Nelson, is the task of American industry during the next "Ten Silver Months." And to that gigantic task American industry now must bend every ounce of its abundant strength.



President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

Set-Ups on Unusual Parts

COMPILED BY J. G. MAGRATH, APPLIED ENGINEERING DEPARTMENT, AIR REDUCTION COMPANY

Uneven depth of hardness can often be prevented by making slight changes in the equipment or methods that are employed

WHEN PARTS of small diameter are to be flame hardened on flat surfaces as shown in Fig. 89, the inside flames of the tip, if swung from a center on a radius, will travel slower than the outside flames, the inside circumference being less. If the speed of the tip travel is properly set for the required hardness depth on the basis of the outside circumference dimension, then the inside edge is receiving more heat per given time period than the outside circumference. As a result greater depth of heated and hardened area will occur on the inside circumference, as indicated in Fig. 89*a*. Compensation can be provided by elevating the tip on the inside diameter as shown in Fig. 89*b*, so that less heat is applied on the inside circumference. The degree of angle employed will vary with the differential between inside and outside diameters.

Handling Curved Surfaces

Often curved surfaces will be encountered on which the curvature, while not great, is sufficient to prevent the employment of a standard tip used for flat surfaces. Where the radius of the curve is sufficiently large, alterations as noted in Fig. 90*a* may be made in the standard flat tip to accommodate the flame and quench contour to that of the surface. A series of cut-backs, centered between flame orifices, are machined to make the contour and to still provide a right angle face of metal at the orifice exit so as to prevent burning the edges of the flame orifices. An opposite condition, similarly provided for, is shown in Fig. 90*b*, which also shows a slightly raised platform. Two of the rear row of flame orifices are plugged so that they will not impinge upon the platform edges and cause burning.

Certain parts may have a large mass of metal adjacent to a smaller mass with the smaller to be hardened as shown in Fig. 91. In such cases there is a possibility of the larger mass drawing the heat from the smaller and keeping it from reaching the hardening temperature. To offset this con-

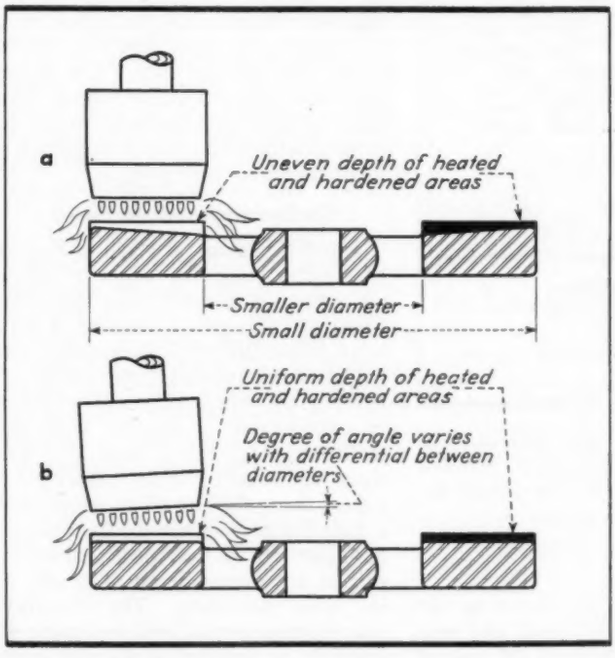

a
Uneven depth of heated and hardened areas
Smaller diameter
Small diameter
b
Uniform depth of heated and hardened areas
Degree of angle varies with differential between diameters

Fig. 89—*Overheating the inner part of flat surfaces of small diameter can be avoided by elevating the tip on the inside edge*

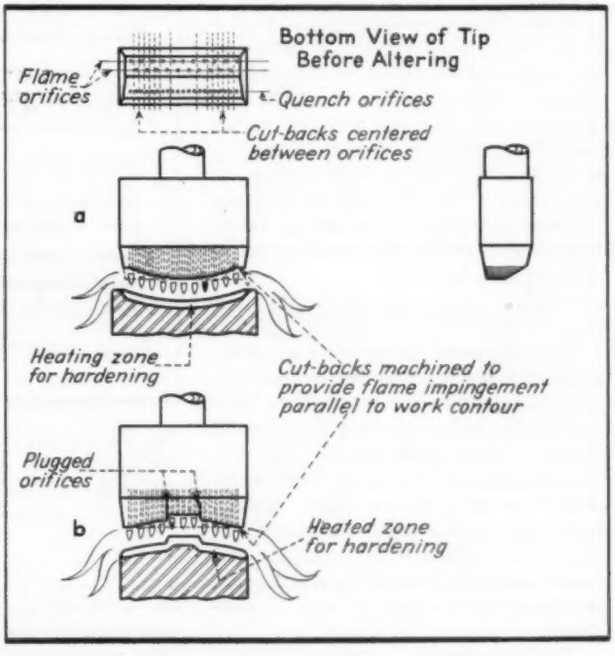


Fig. 90—*Block tips can be machined to fit contours. In* b *two orifices have been plugged to avoid burning the platform edges*

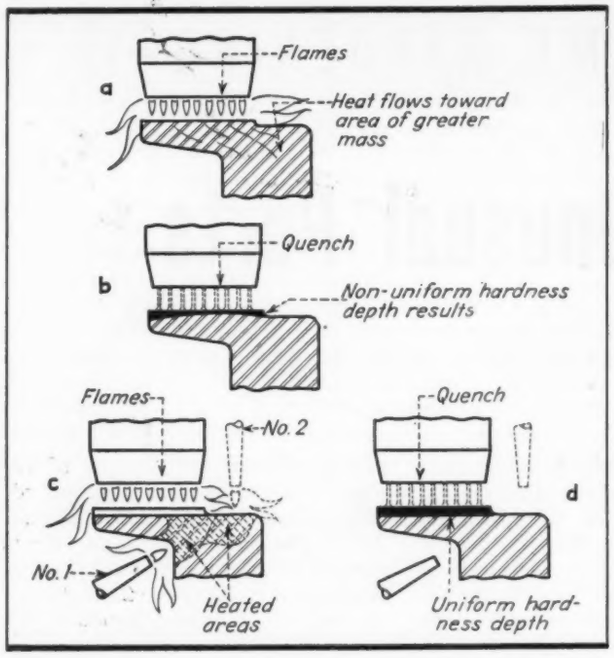


Fig. 91—*Auxiliary flames are sometimes needed to keep a large section from withdrawing heat from the small section being hardened*

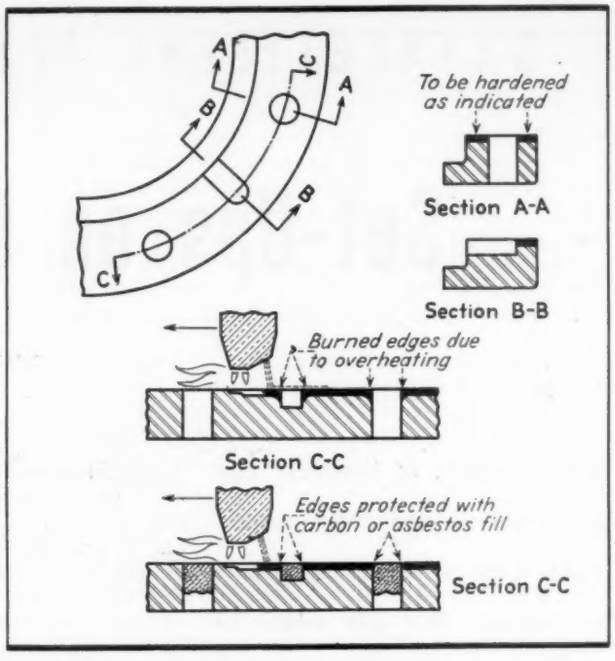


Fig. 93—*Burning around the edges of holes is avoided by filling them with carbon or asbestos, or a mixture of both, which results in uniform hardness*

dition, as indicated in Figs. 91*a* and 91*b* it is frequently necessary to play a heating flame, No. 1, and often a second flame, No. 2, upon nearby areas as shown in Fig. 91*c*. Thus the larger adjacent mass is raised in temperature preventing cooling of the smaller mass. When the hardening temperature is attained only the area to be hardened is quenched as shown in Fig. 91*d*.

In hardening paths with flat multi-flamed tips excessive heat penetration may occur at the center of the path as shown in Fig. 92*a*. To overcome this condition the spacing between flames should be graduated from close spacing at the outside edges to wider spaces at the center as in Fig. 92*b* to produce uniform heat penetration so that when quenched as in Fig. 92*c* uniform hardness depth is obtained.

Edges Must be Protected

The edges of holes, slots or other recesses in areas of surfaces to be surface hardened must be protected. Otherwise, due to overheating, they may be burned as seen in Section C-C, Fig. 93. The insertion of carbon or asbestos, or a mixture of both, as fillers, in such openings, as detailed in Section C^1C^1, Fig. 93, will prevent this condition and result in a uniformity of hardness penetration at these edges as well as elsewhere.

The oxyacetylene carburizing and hardening process is meeting with increasing recognition. While the impregnation of steel with carbon from the acetylene flame is subject to the limitation of mass of metal and will only penetrate to a depth of several thousandths of an inch, this is generally sufficient on the wearing and sliding surfaces of light automatic vending machinery and similar construction. For example in Fig. 94 a group of $\frac{1}{16}$ in. thickness SAE 1010 carbon steel automatic machine parts are nested and tightly clamped together. Heating flames are traveled along the tops, near the edges of the slotted areas and are followed by either a highly excessive acetylene flame, or an entirely acetylene flame, of long feathery character which projects carbon into the heated area for a depth of several thousandths of an inch. The water quenching which quickly follows provides a sufficient hardness depth to withstand the amount of wear generally experienced on such parts.

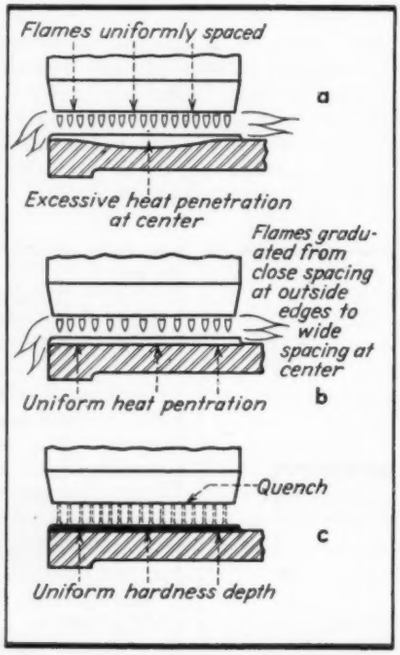


Fig. 92—*excessive heat pentration at the center of a path may be avoided by under spacing of the flames toward the center*

Carburizing a Roller Track

Another example is given in Fig. 95 of a roller track, the edges of which are subjected to wear from the roller bearings. This part is likewise of SAE 1010 cold rolled steel. Previously these tracks were cyanide case hardened, treating the whole part and resulting in considerable distortion. With the track stationary, a two flame tip, each flame followed by water quench, was passed along the top edges, employing a long feathery excess acetylene flame. Sufficient carbon was projected to result in a hardness depth of nearly $\frac{1}{64}$ in. after quenching. The distortion was inconsequential and was compensated for by prebending the part, prior to flame application, in the opposite direction for the equivalent of the distortion range.

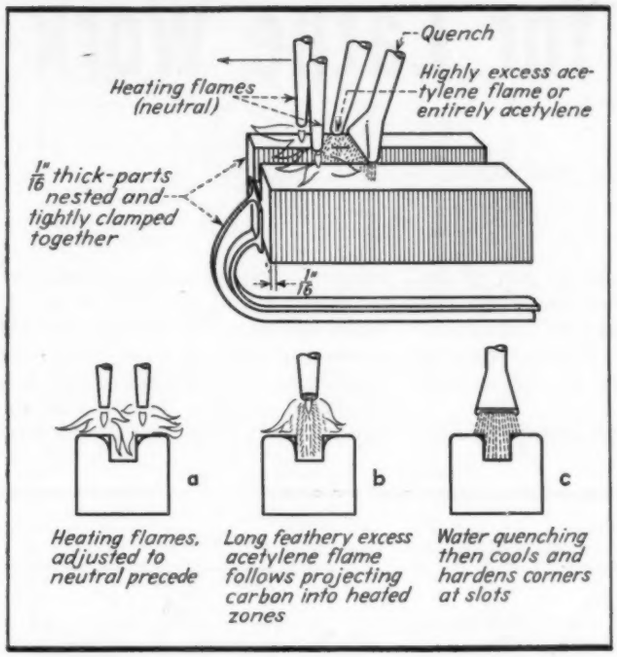

Quench
Heating flames (neutral)
Highly excess acetylene flame or entirely acetylene
1/16" thick-parts nested and tightly clamped together
1/16"
a
b
c
Heating flames, adjusted to neutral precede
Long feathery excess acetylene flame follows projecting carbon into heated zones
Water quenching then cools and hardens corners at slots

Fig. 94—*A group of machine parts are clamped together and carburized with an excess acetylene flame of long feathery character before hardening*

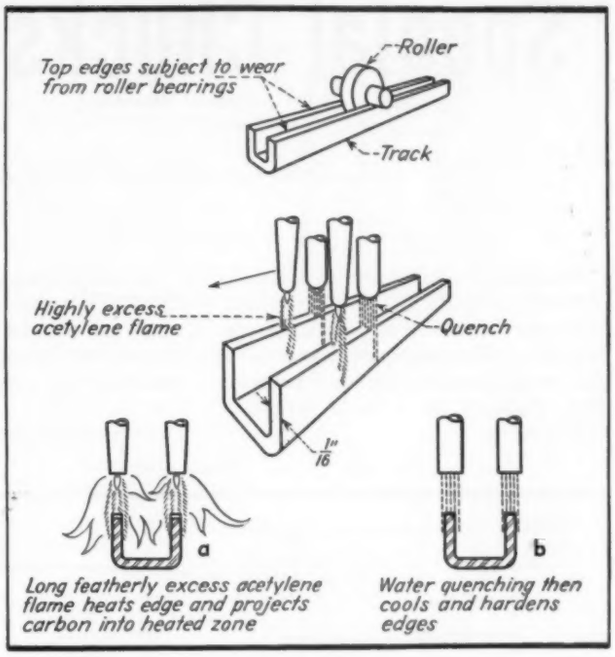


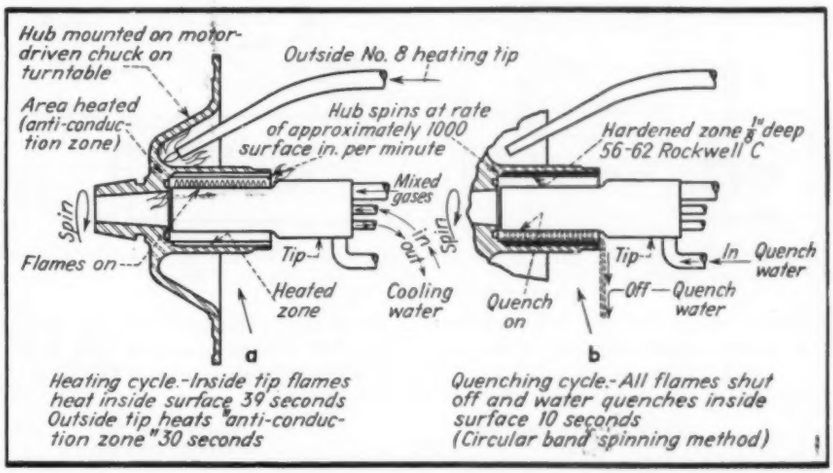
Fig. 95—*Distortion of this roller track caused by case hardening is avoided by using the excess acetylene flame for carburizing the edges*

Those interested in further study of any of the many phases of oxyacetylene flame hardening are referred to the works and research of the authors listed in the running bibliography of this series as well as the list of references. As stated earlier, there may be other methods of procedure differing from those presented here which provide equal satisfaction.

In the course of preparation of this work, the compiler has repeatedly drawn both on the direct aid and the comprehensive technical papers of the following Air Reduction personnel: George F. Slottman, Manager, Applied Engineering Department; John J. Crowe, Assistant to Vice President and Operating Manager; H. E. Landis, Jr., Manager Apparatus Research & Development Dept.; and Stephen Smith, Specialist in Flame Hardening.

Appreciation is extended to all those mentioned whose works have directly or indirectly contributed to the compilation of this useful information on oxyacetylene flame hardening.

This is the last of eighteen articles on oxyacetylene flame hardening.


Hub mounted on motor-driven chuck on turntable
Outside No. 8 heating tip
Area heated (anti-conduction zone)
Hub spins at rate of approximately 1000 surface in. per minute
Hardened zone 1/8" deep 56-62 Rockwell C
Mixed gases
Spin
Flames on
Tip
In
Out
Spin
Heated zone
Cooling water
Quench on
Tip
In Quench water
Off—Quench water
a
b
Heating cycle.-Inside tip flames heat inside surface 39 seconds Outside tip heats "anti-conduction zone" 30 seconds
Quenching cycle.-All flames shut off and water quenches inside surface 10 seconds (Circular band spinning method)

Fully automatic flame hardening *is used on the inside surfaces of automobile wheel hubs. The mass of metal in the heavy flange tends to transfer heat from the inside tip, so an outside tip is used to heat an "anti-conduction zone." The cycle, controlled by a series of motor-driven cams, proceeds as follows: (1) Inside tip moves into hub; (2) hub spins; (3) inside tip lights; (4) outside tip lights; (5) inside surface reaches critical; (6) outside tip extinguishes after 30 sec. heating; (7) inside tip extinguishes after 39 sec. heating; (9) inside tip moves out of hub; (10) turntable swings new hub into position*

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C. Dehasee	J. C. Hodge	H. H. Moss	A. E. Shorter	G. B. Taylor
W. Eberle	H. Holler	C. E. Prytz	Roy L. Spaulding	D. Vandevate
A. B. Everest	H. Kallen	E. Ruck	Dr. Thomas Swinden	E. Zorn

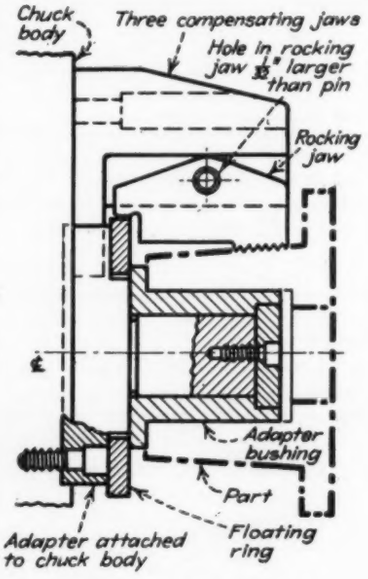
Special Chucks for Lathe Work

BY JOHN G. JERGENS, CLEVELAND PNEUMATIC TOOL COMPANY

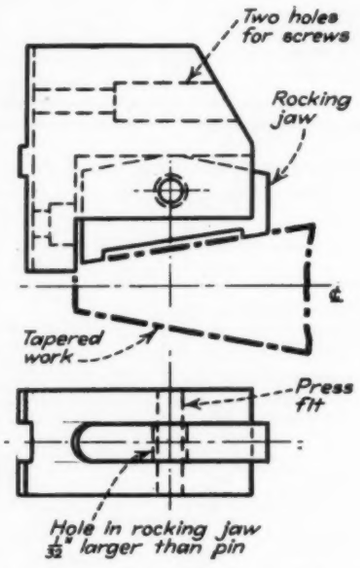
THE TYPE of chuck used on a lathe is determined by the design of the workpiece and the volume of production contemplated. The examples shown in the following diagrams provide rapid, positive chucking for a wide variety of applications.

In many cases a single part of the chuck is adapted to suit the work. The chuck can then be used on limited production for a number of similar parts by changing the adapter in each case to suit the work.

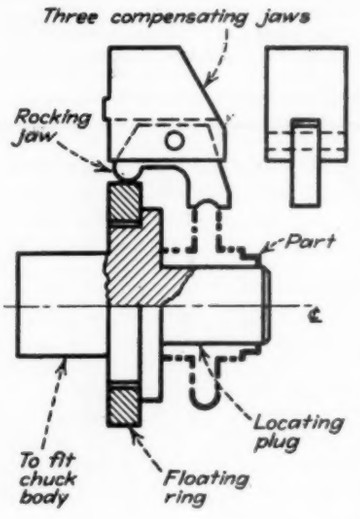
Several examples are shown of chucks using rocking jaws, collets and adapters for threaded work in which the part is locked against a stop. Also illustrated is a swinging stop which can be used on turret lathes and will make an extra turret station available for use after the stop has been swung out of the way.



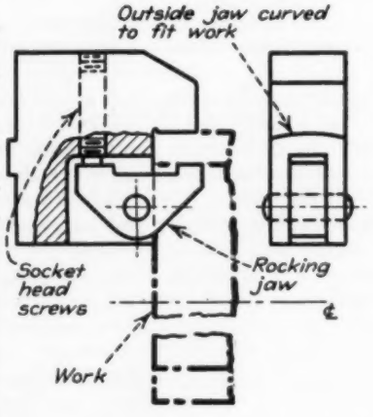
Three rocking jaws grip the work over a special adapter bushing; a floating ring equalizes jaw pressure



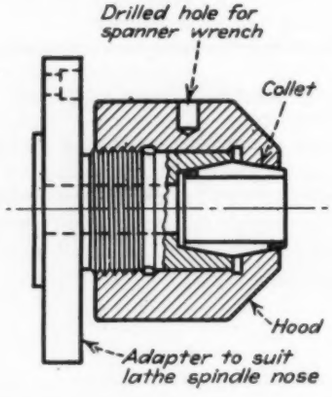
On chucks for tapered work, the floating ring is eliminated and both ends of the rocking jaws grip the work



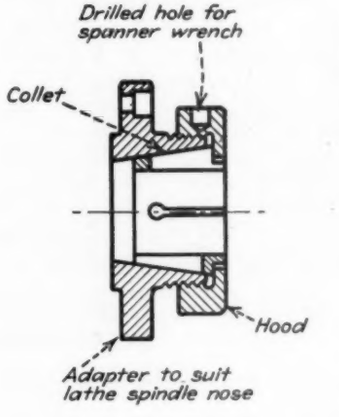
This modification of the compensating rocking jaws is used for gripping the curved edges of flanged part



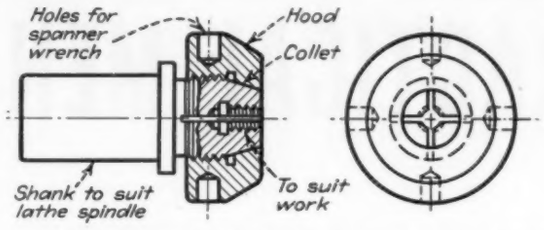
An internal pinch, applied by tightening the socket screws, holds cylindrical work against the outside jaws



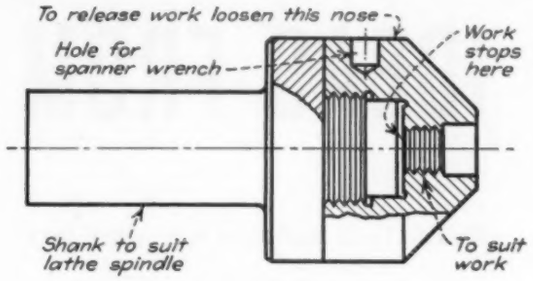
Tightening the hood of this collet chuck with a pin or spanner wrench produces a double wedge action which locks the collet around the work



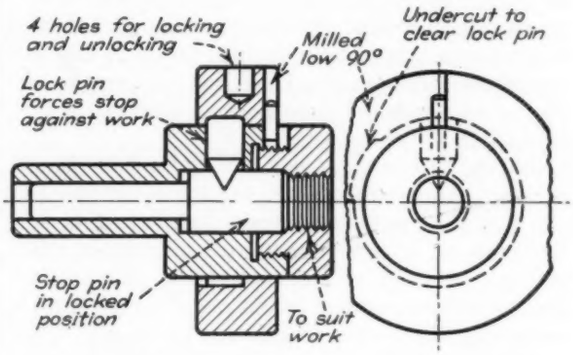
This variation of the collet chuck uses a shorter hood which locks the collet by forcing it into a single cone



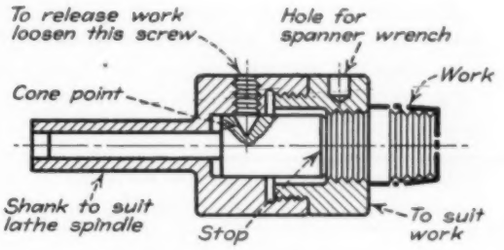
For threaded work this chuck uses a collet which is tapped to match the part



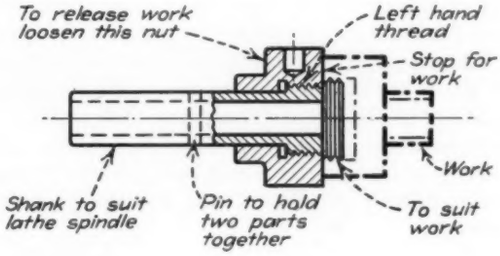
Threaded work is screwed into the nose by hand, and is locked by tightening the nose of the chuck


4 holes for locking and unlocking
Milled low 90°
Undercut to clear lock pin
Lock pin forces stop against work
Stop pin in locked position
To suit work

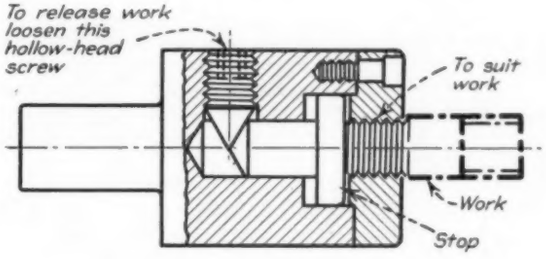
In this modification the work is quickly locked by turning the chuck collar. Cam action of an undercut in the collar forces a lock pin into the stop



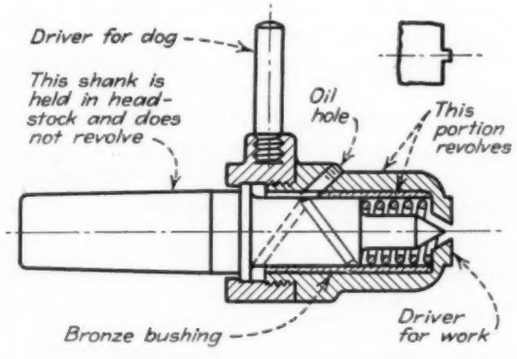
In another form of adapter for threaded work, a socket screw is used to tighten the cone point in a stop; the threaded end can be changed to suit work



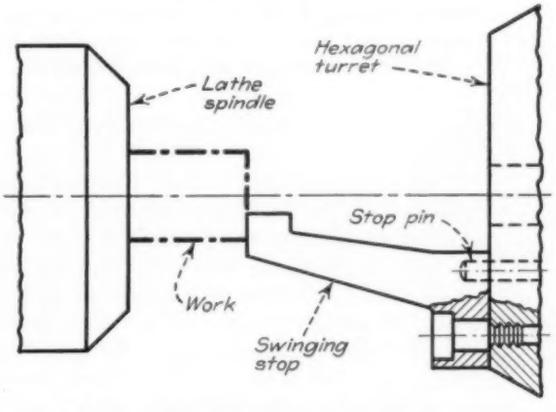
Internally threaded fittings can be held in this adapter because the nut, turning on a left-hand thread, tightens against the work to form a stop



A threaded nipple is turned into the nose of the chuck and locked by a socket screw or wedge. The nose can be changed to suit the work



The work is centered on the point of stationary shank and is driven by a lug which fits into a slot in the work. Pressure to hold the lug in place is provided by a spring resting against the shank



This swinging stop for turret lathes can be used to make an extra turret station available. A tool can be attached to the same face and used after the stop is swung out of the way

IDEAS FROM PRACTICAL MEN

Carbide Tools Applied to Interrupted Cuts

BY HARRY E. LEWIS

The application of sintered carbides to cast armor, especially on interrupted cuts, presents many problems not covered by standard carbide grinding procedure. Surface speeds up to 150 ft. per min. can be maintained on cuts of this character but provision must be made to reduce the impact caused by the high r.p.m. Both machine and tool life are increased by eliminating impact and providing a free cutting edge. The grinding technique described here provides both these desirable qualities.

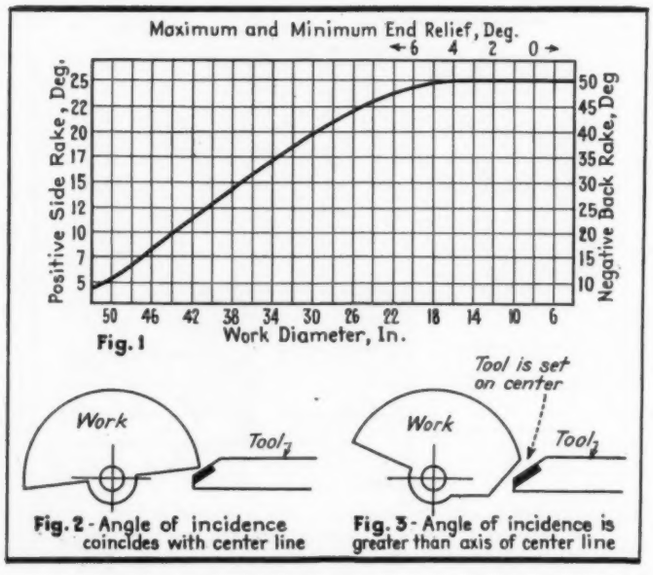

Maximum and Minimum End Relief, Deg.
←6 4 2 0→
Positive Side Rake, Deg.
25 22 20 17 15 12 10 7 5
Negative Back Rake, Deg
50 45 40 35 30 25 20 15 10
50 46 42 38 34 30 26 22 18 14 10 6
Work Diameter, In.
Fig. 1
Tool is set on center
Work
Tool
Work
Tool

Fig. 2 - Angle of incidence coincides with center line

Fig. 3 - Angle of incidence is greater than axis of center line

Interrupted cuts on cast armor can be made with sintered carbide tools, but the tool must be designed so that the cut will start behind the tip of the tool when it is able to resist impact

To use the chart, Fig. 1, start at the bottom with the diameter of the work piece and travel vertically to the intersection of the curve line. The figure to the right is the negative back rack, to the left, the positive side rake and at the top is the positive end relief. Notice that all diameters above 20 in. require the maximum of 6 deg. Diameters under 20 in. do not require so much end relief on outside turning but if the tool is used on boring this does not apply. If it is necessary to adjust the negative back rake because of the angle of incidence, remember that the original side rake is probably sufficient. Increasing the side rake unnecessarily will weaken the cutting edge. The usual 15-deg. lead angle has proven quite satisfactory for most applications but it can be altered to suit conditions without affecting the cutting action of the other angles.

It would seem at first that the negative back rake established by the chart is excessive, as it would be for anything but carbide. However, it must be remembered that carbide tools require that the tip be kept in compression during the cut and that the pressure of the cut be distributed throughout as much of the tip as possible.

In Fig. 2 the cut will start well behind the tip of the tool. This is particularly important for only in this way will a carbide tool resist the shock of an interrupted cut. Fig. 3 illustrates the necessity of considering the angle of incidence of the work to the tool. It will be seen that in this case the angle established for this diameter would not be correct. The full impact would fall on the tip of the tool and cause failure. It then becomes necessary to correct the angle on the tool so that it approaches the work at the correct angle as shown by the chart.

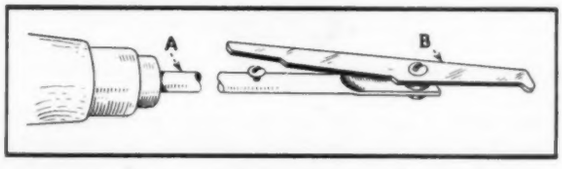
Although the information given by the chart is the result of extensive experimentation on cast armor ordnance it is well to remember that the use of carbides on interrupted cuts is comparatively new and the figures given are best considered as a safe beginning rather than the last word. These same tools applied to planer work and using 40-deg. negative back rake and 20-deg. positive side rake have given excellent service at 50 surface f.p.m. and outlasted several high speed steel tools.

Heat Indicator Shows Quenching Temperature

BY C. F. FRITZ

One of the difficulties encountered by the mechanic in connection with the heat treatment of steel in the small shop where the facilities are limited is to know when tool steel has reached the proper temperature for quenching.

We have solved the problem in our shop by making the heat indicator shown in the drawing. It consists of brass rod *A* fitted to a file handle and with permanent magnet *B* attached to the other end.



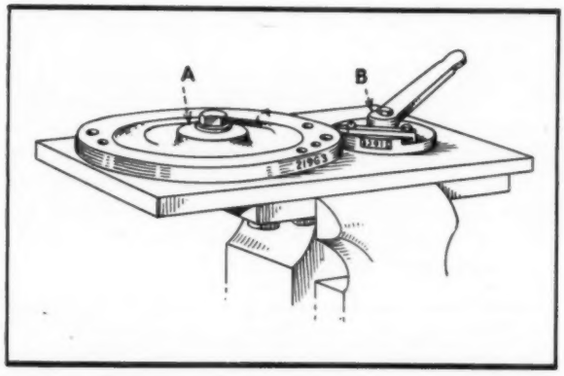
This heat indicator for a small shop takes advantage of the fact that tool steel loses its magnetism when it has reached the proper quenching temperature

Tool steel has reached its proper quenching temperature when it has lost its magnetism, so it is simply a matter of heating the steel to a point where it will no longer be attracted by the magnet. The tool steel is then quenched in the usual manner. It should be noted that this method is satisfactory for straight carbon and low alloy tool steels, but will not work with high carbon or high chromium steels.

Aluminum Rings Stamped by Simple Method

BY FRANK C. HUDSON

Aluminum rings about 8 in. in diameter require a serial number stamped on the outer surface. This is done with the stamping device shown in the illustration. Ring *A* is mounted on a stud on the plate which is held in a vise. The stamps are carried in circular holder *B*. The center distances are so spaced that the ends of the stamps will make an impression of the correct depth when the stamp holder is swung past the ring, which revolves because of contact with the stamps. The shanks of the stamps are ground to the right taper to fit into the holder. They are changed for each ring to secure the continuous serial numbers desired.



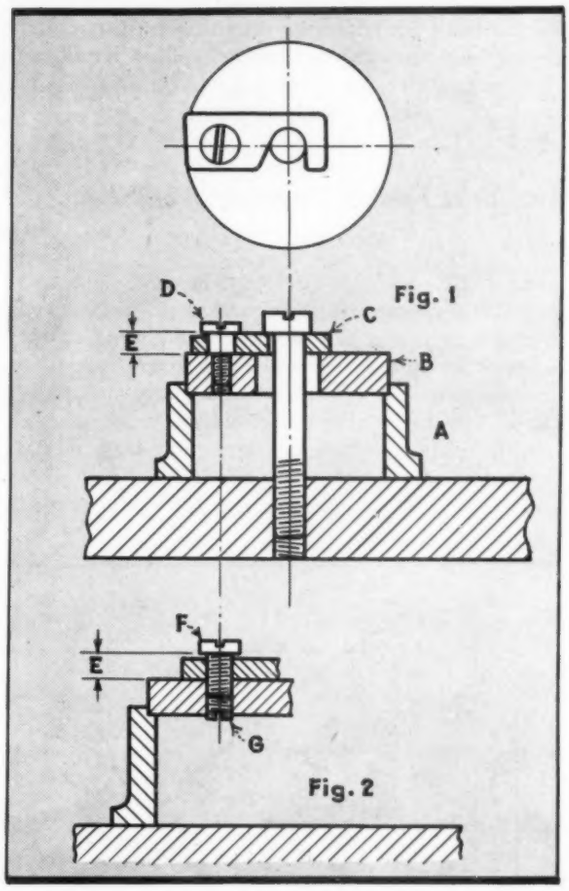
Serial numbers are punched on large aluminum rings by placing tapered stamps in the holder and swinging it past the ring, which is free to rotate

How to Avoid Special Shoulder Screws

BY EUGENE GROSZ

In the construction of a jig or fixture there are many times when a shoulder screw of special size is necessary. In the fixture shown in Fig. 1, for example, the part to be machined is ring *A*. Clamping ring *B* is removable through the use of latch *C*. Shoulder screw *D* must have height *E* which is slightly greater than the thickness of latch *C*.

For a simple set-up of this type the time spent in making a special shoulder screw is not always warranted, and we have found a method of successfully avoiding it. Fig. 2 shows part of the same fixture in which standard fillister head screw *F* has replaced the



In many simple fixtures the use of special shoulder screws can be avoided by tightening a set screw against the lower end of a standard head screw

shoulder screw. By tightening standard headless set screw *G* against the end of screw *F* the desired height *E* can be easily adjusted and permanently fixed.

Drill Press Used for Profiling

BY FRED H. COLVIN

A small shop had a number of comparatively thin pieces of hard rubber to cut to a definite shape. They were too big to consider using a punch and die because no punch press of sufficient size was available and the cost of tooling would have been prohibitive. It was also feared that the rubber might break around the edges, or at least not have as smooth an edge as desired.

The problem was solved by making a template of quarter inch metal, with pins which located small holes previously drilled in the rubber. A small end mill was used as a routing cutter on a high speed drill press with a table large enough to handle the work. A hardened pin of the same diameter as the milling cutter was mounted directly under the spindle and the table was locked so it could not be moved.

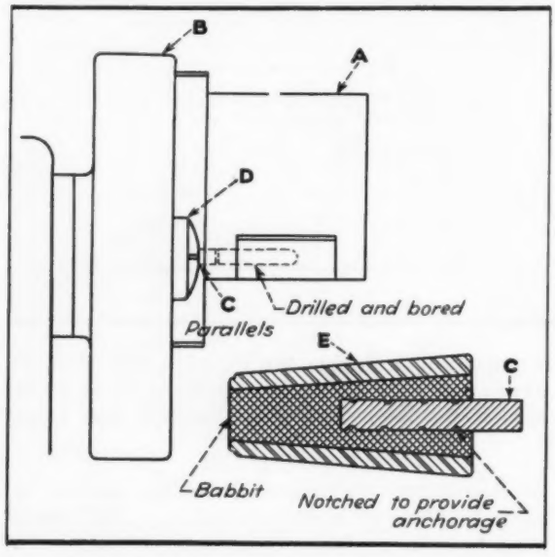
All the operator had to do was to move the template around on the table, keeping the edge against

the hardened pin until the work had been trimmed by the cutter. For work which can be handled in this way this method gives the same results as a profiler and can be done on any good drill press.

Long Holes Finished Accurately in Drill Jigs

BY DANIEL I. KRAUSS

In making leaf-type drill jigs, the hinge-pin hole must be bored and reamed square with the leaf and jig body to permit easy opening and closing of the jig without binding, as well as to assure long life, freedom from excessive wear and accuracy of holes in the drilled parts. The hinge-pin holes are usually long in relation to their diameter, and unless special equipment is available, it is not easy to drill, bore and ream them accurately. The following method



Long holes in jig bodies can be finished accurately by drilling and boring half of each hole to meet at the center, and finishing it with a through reamer

gives excellent results when the hole can be bored half its length with a single-point tool.

Grind all sides of the jig body *A* parallel and square. Strap it on a lathe faceplate, which must run true, and add counterweight to limit vibration which will result from the offset position of the jig body on the faceplate. The hole for the hinge pin is laid out, drilled slightly more than halfway through the jig body, and bored to a diameter 0.002 in. undersize.

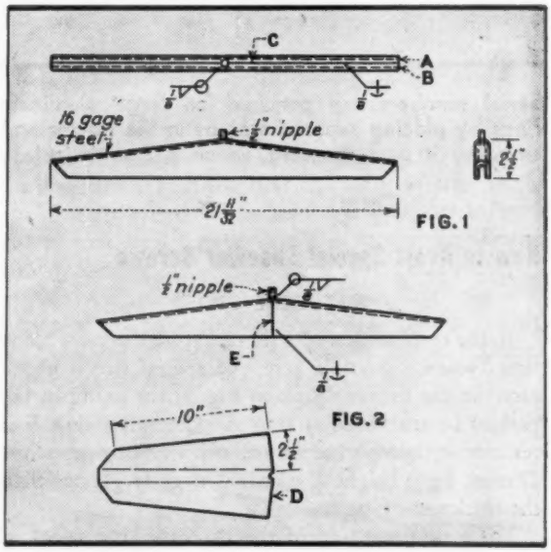
The jig body is then removed from the faceplate, and remounted as shown in the drawing. The plug *C* is turned to fit the hole previously bored half way through the jig body, and is held by collet *D*. In case a draw-in collet is not available, plug *C* can be held in a headstock center sleeve *E*. The plug need not enter the hole more than $\frac{3}{16}$ in. to center the jig body accurately. The body can then be laid out, drilled, bored and reamed to meet the half of the hole finished previously. Obviously, the reamer cannot be made to cut through the hole while in the lathe. The remaining $\frac{1}{4}$ in. or less may be reamed after the jig is removed from the lathe.

I use this method exclusively for finishing hinge-pin holes in drill-jig bodies. The criticism might be offered that the hole could be drilled through and then bored from both sides. The objection to this is the time required to bore the hole through, due to the drill run-out. It has been my experience that drilling and boring from both sides is faster and more economical. The reason for boring the first half of the hole slightly undersize is to permit the reamer to finish the hole in one continuous cut during the second set-up on the faceplate.

Design Change Reduces Production Cost

Engineers at the Gross Machinery Co., Buffalo, N. Y., recently changed the design of an arc-welded bottom plate of a filter for dry-cleaning fluid, thereby reducing its overall cost 65 percent. The original design of the plate is shown in Fig. 1. It was formed from two $21\frac{11}{32}$-in. pieces of 16-gage stock *A* and *B*. These were flanged on the long tapered edge, and butt-welded together on the seamline *C*. The $21\frac{11}{32}$-in. weld was made with $\frac{3}{32}$-in. Fleetweld 7-in. electrodes.

The concern now makes this filter bottom plate from two sections *D* blanked to the shape shown in Fig. 2, and then bent along the dashed line to form a U-channel. The two pieces are then butt-welded along the vertical seam *E*. This design requires but 5 in. of butt-welding, saving $16\frac{11}{32}$ in. of welding per piece; furthermore, it eliminated the difficult and expensive flanging operation needed when the piece was formed as shown in Fig. 1.



The arc-welded filter plate in Fig. 1 involved a difficult flanging operation and required 21 11/32 in. of butt-welding. It was redesigned as shown in Fig. 2. The flanging operation is eliminated

Working with CUTTING FLUIDS

CUTTING FLUIDS, frequently referred to as lubricants or coolants, consist of those liquids and gases which are applied to the tool and material being machined to facilitate the cutting operation. They are used to accomplish the following purposes, singly or in combination:

1. To keep the tool cool and prevent it from being heated to a temperature at which its hardness and resistance to abrasion are reduced.
2. To keep the work cool, thus preventing it from being machined in a warped shape resulting in inaccurate final dimensions.
3. Possibly through lubrication to reduce the power consumption, wear on the tool, and the generation of heat.
4. To provide a good finish on the work.
5. To aid in providing a satisfactory chip formation.
6. To wash away the chips, particularly in deep hole drilling, hacksawing, milling, and grinding.
7. To prevent corrosion of the work and machine.
8. To lubricate moving machine parts close to the cutting tool.

In different operations these factors vary in importance and usually some are obtained at the expense of others. For instance, in heavy roughing cuts, temperatures as affecting distortion and surface finish are of little consequence. In screw machine work, however, surface finish, dimensional accuracy as affecting interchangeability and long tool life are of great importance. For each case, desired results are obtained by varying (*a*) the tool material and shape, (*b*) the cutting speed, feed, and depth of cut, (*c*) the structure of the material cut, and (*d*) the cutting fluid. As far as the cutting fluid is concerned, its performance must be based on its success for each particular application to a specific metal, tool, and cutting operation.

Nevertheless, there are certain properties desirable in any cutting fluid; they are summarized as follows:

1. High heat absorption, that is, high thermal conductivity.
2. Good lubricating qualities.
3. High flash point, that is, not liable to spontaneous combustion and the hazard of fire.
4. Freedom from precipitation of solids at ordinary working temperatures.
5. Stability, so as not to oxidize in the air or give rise to gummy deposits on the sliding surfaces of the machine.
6. Components not easily becoming rancid.
7. No unpleasant odor when heated or after continued use.
8. Not injurious to the skin of the operator either directly as from high acidity, or indirectly by contamination.
9. Not injurious to the bearings of the machine, even if mixed with the machine lubricants or applied directly to the bearings.
10. Non-corrosive to the work and machine, and a rust preventative.
11. Fairly transparent when the cutting action of the tool must be observed. On some jobs, transparency can be sacrificed to utilize the quality performance of certain types of cutting oils.
12. A viscosity that will permit free flow from the work back to the storage tank, and to drip from the chips.

The development of cutting fluids with the foregoing characteristics and properties probably began about 1883 when F. W. Taylor demonstrated that a heavy stream of water, directed upon the cutting tool when turning steel, increased the cutting speed 30 to 40 percent. Shortly thereafter water and water-soda solutions were used extensively as coolants for cutting tools. However, satisfactory results were not obtained in all cases; consequently, experiments were made using animal and vegetable oils. Lard oil proved to be the most satisfactory.

With the development of mineral oils, it was found they could be used on light cutting operations and in machining brass. On more difficult machine operations, fatty oil, such as lard oil, was blended with mineral oil in proportions ranging from 10 to 40 percent fatty oil and 90 to 60 percent mineral oil, respectively.

Improvements in machine design, permitting higher cutting speeds, and the development of better steel for cutting tools through increased hardness and toughness, demanded further development in cutting oils. At first, higher percentages of fatty oils were mixed with mineral oils, and in some cases the fatty oil was even used straight. Further advancement in manufacturing methods, as well as the high cost of fatty oils and the gumming effects produced on the machines, necessitated further cutting oil research. As a result, cutting oils with additives such as sulphur, chlorine, phosphorus, fatty acids, and other materials and compounds, have been developed. Exhaustive research has indicated that sulphur is the most satisfactory additive.

This special section was made possible through information obtained from the following sources:

American Society for Metals
Carboloy Company, Incorporated
Cincinnati Milling Machine Company
Cities Service Oil Company
Fiske Bros. Refining Company
Gulf Refining Company
E. F. Houghton & Company
Norton Company
Pure Oil Company
Shell Oil Corporation
Socony-Vacuum Oil Company
Standard Oil Company of Indiana
D. A. Stuart Oil Company, Limited
Sun Oil Company
Swan-Finch Oil Corporation
Texas Company
Tide Water Associated Oil Company
University of Michigan

TYPES OF CUTTING FLUIDS

Cutting fluids may be divided into the following classes:

1. Air used as a blast or induced draft.
2. Aqueous solutions such as plain water or water containing a small percentage of alkali.
3. Emulsions of a soluble oil or paste.
4. Oils of animal, vegetable or mineral types, which may be used straight, compounded or blended. They may be sulphurized or otherwise treated to improve their qualities as a cutting fluid.

AIR

Air is often applied as a suction or blast with cutting operations such as turning or boring cast iron, or on surface grinders and polishing machines. Its main purpose is to remove small chips and dust, but some cooling is also obtained.

AQUEOUS SOLUTIONS

Plain water or water containing an alkali makes a satisfactory cutting fluid where cooling and washing away chips are required, as in grinding, drilling, sawing, light milling, or turning. The fluid is inexpensive, but does not prevent the formation of rust on the machine and work if used carelessly. Such aqueous solutions contain up to 2 percent by weight of an alkali, such as borax, sodium carborate, or trisodium phosphate.

SOLUBLE OILS

The soluble oils usually consist of a mineral oil, and animal or vegetable oil, plus an emulsifier such as soap. Lard, tallow or synthetic fats are used for the fatty oils. The emulsifiers include the following: acid sludges; turkey red oil; diethylene glycol; saponafied phenol; saponafied naphthenic acids, usually used up to 15 percent; or alcohol. Various trade compounds, using pure organic compounds and non-organic compounds either in combination with mineral oils or alone, also are used as soluble oils.

Cutting pastes are sometimes used in which a saponafied mineral oil, very high in soap content to make it into a grease-like consistency, is used. These are mixed with water to form emulsions.

Emulsions of soluble oils or paste are made up in the ratio of one part oil to 5-100 parts of water, depending upon the type of product and the machining operation. They are low-cost cutting fluids and are used for practically all cutting and grinding operations on all types of metals.

Soluble-oil emulsions are applicable where the cooling requirement predominates, although they are capable of forming stronger films and assuring greater protection against corrosion than water or alkaline solutions.

STRAIGHT CUTTING OILS

Straight cutting oils include mineral oils of any desired viscosity, and straight fatty oils. Straight mineral oils are suitable for light-duty cutting, particularly on non-ferrous metals, where both lubrication and cooling may be necessary, but neither requirement is severe. They are used to some extent for light-duty cutting on automatics where an emulsion might cause trouble by replacing the lubricating oil on machine parts, thereby necessitating a shut-down for cleaning. Straight mineral oils are not satisfactory for severe requirements, but when they are used best results will be obtained from the relatively low viscosity grades which have good penetrating and cooling properties. At the present time, the greatest use of mineral oils in metal cutting is in blending them with cutting oil bases in the necessary proportion to suit specific requirements.

Straight fatty oils, such as lard oil, were formerly used almost entirely for severe operations. However, the development and subsequent improvements in sulphurized cutting oils, as well as the high cost of animal fatty oils, has relegated fatty oils to a subordinate position, particularly for machining the tougher steels and alloys. When cutting oils containing sulphur objectionably tarnish the material being machined, lard and other fatty oils may be used, or parts can be treated after machining to remove tarnish.

The primary objection to the use of straight animal fatty oils is their tendency to become rancid and when this happens the odor is objectionable. Such oils permit bacteria to breed and cause skin troubles among the operators.

MINERAL-LARD OILS

Blends of mineral and fatty oils are used for economic reasons, since for most machining operations where straight lard oils are suitable their cost is prohibitive. Therefore, under operating conditions requiring a cutting fluid of greater lubricating value than mineral oil, the mineral-lard oils are used. The percentage of fatty oil varies from 10 to 40 percent, the amount being increased with increase in hardness of the stock being machined, or where deep cutting is essential. Lard oil, either as No. 1 or prime lard, is the most commonly used animal fatty oil; in addition, many synthetic fats are employed. The blends using synthetic fatty oils are still referred to as mineral-lard oils; they have many of the desired cutting characteristics of oils blended from mineral and animal fatty oils.

Mineral-lard oils are used quite extensively in automatic screw machines where a better surface finish is required than could be obtained by the use of a straight mineral oil. Their adaptability to tool cooling and lubrication in metal cutting is explained by the fact that they possess a certain degree of oiliness, along with a relatively low viscosity. This not only accelerates the rate of heat transfer, but also promotes separation from chips and foreign matter.

The percentage of lard oil in blended cutting fluids is a matter of determination under actual operating conditions. In general, it is desirable to use a cutting oil with the lowest percentage of lard oil that will do the work, because too great a percentage not only increases the cost but also tends to increase rancidity, disagreeable odor, and unsanitary conditions with continued use.

SULPHURIZED OILS

In general, sulphurized oils may be classified into the three following groups:

1. Animal or vegetable oils with cooked-in sulphur.

2. Sulphurized mineral oils—they consist of straight mineral oil in which the active sulphur content is usually not more than 3 percent. This oil is used as prepared, but may be blended further with a light mineral oil for some work.

3. Sulphurized base oils—these include a fatty oil to which is added from 8 to 20 percent active sulphur, the mixture serving as a base, commonly called "sulphur base." This base is then diluted to approximate cutting strength and viscosity by blending with 5 to 20 parts straight mineral oil of a viscosity such as 110 Saybolt seconds at 100 F. The resulting blend is quite transparent and has a low viscosity.

Sulphurized oils may be processed

further with chlorine. Such sulphurized-chlorinated cutting fluids are usually lighter bodied than the sulphurized type, and are reported to retain higher quantities of active sulphur.

Oil refined from high-sulphur crude is produced with a natural sulphur conadded quantities of active sulphur. The natural sulphur is inert and of little value in cutting oils.

Sulphurized oils in the second and third groups mentioned above are used extensively for machining straight carbon or alloyed steels, stainless steel, high nickel alloys and copper. Ordinarily, the soft stringy steels require an oil of high sulphur content, while the steels which are harder and more brittle require less sulphur. In general, broaching, threading and tapping require high sulphur oils, while drilling and reaming, shaping and turning, milling and hobbing require oils with low sulphur content.

ACTION OF CUTTING FLUIDS

The generation of heat and high chip pressures which accompany the cutting of metals, necessitating the cooling and lubricating qualities of cutting fluids, can be explained by one of the most generally accepted theories of chip formation. A wedge-shaped body of metal precedes the nose of the cutting tool and seems to cling to it, while the main body of the chip moves over it, this action being more evident in the cutting of tough metals. This is referred to as the "built-up" edge, and is shown in the accompanying illustration.

Particles of the built-up edge break away with the work and result in a rough and uneven machined surface, as well as tool erosion. Furthermore, at the point where the chip bears on the rake of the cutting tool, there is an area of high pressure and temperature. The latter is enhanced by the distortion of the metal in the chip. Such high pressure and temperature causes the metal in the chip to weld itself in the tool. Cutting fluids when properly selected and applied, prevent this welding action, thereby reducing the built-up edge and providing a smooth cut with the least expenditure of power.

The action of sulphur in cutting oil is to prevent the welding of the chip to the tool; in addition, the sulphur particles may act as a semi-solid lubricant and prevent metal-to-metal contact between the chip and the tool after the oil film is broken down under the tremendous pressure and localized heat.

The amount of heat generated in cutting metal varies according to the type of chip produced, cutting speed, the feed and depth of cut, and the type of metal being machined. Brittle metal will break and crumble, causing but little frictional heat. On the other hand, tough metals when machined are productive of intense pressures and high temperatures.

When temperatures are not controlled by proper cutting fluids, extreme heat conditions will cause the cutting edge of the tool to soften and wear abnormally, thereby requiring the grinding of excessive stock from the face of the tool when sharpening.

High temperatures result in expansion of the parts machined. This must be held to a minimum and the action of a cutting fluid as coolant is effective toward this end.

The action of cutting fluids as lubricants becomes important when machining tough metals, since it reduces the built-up edge, and promotes a fine finish, as well as minimizing tool erosion.

EMULSIONS

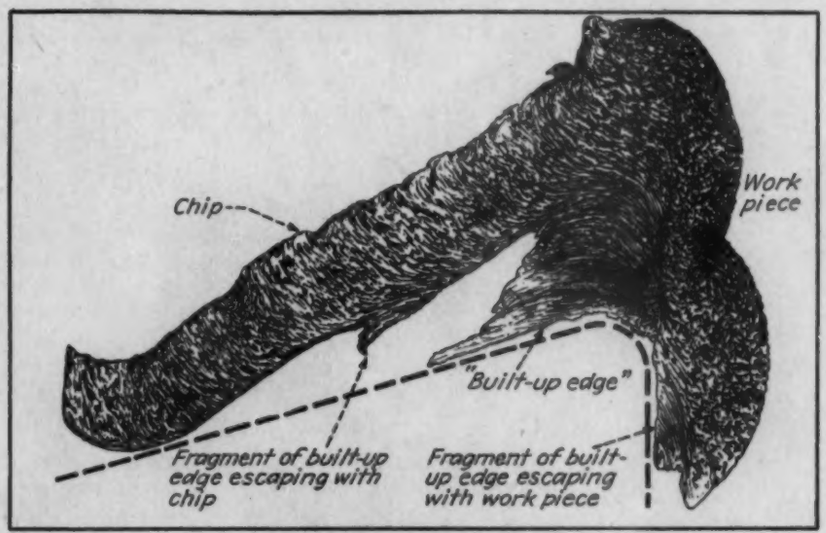
Soluble-oil emulsions usually produce less fumes and possess more cooling power than do straight oils. Soluble oils undoubtedly play a leading part in grinding, milling, drilling, sawing, and similar operations where cooling is the primary requirement.

Although one of the most important functions of a cutting fluid is to limit the temperature of the tool and work, soluble oils cannot in every instance meet all related conditions better than straight-cutting oils. In many operations the use of the most effective lubricant possible is often of paramount consideration, that is, when it is not only necessary to reduce the temperature of the tool and stock, and so minimize distortion, but also to reduce the power required for the cutting operation, facilitate the formation of the chip, and finally to enhance the burnishing action of the tool and thus improve finish.

However, under some severe cutting operations, effective lubrication is sometimes more difficult to obtain than effective cooling, in which case there should be an advantage in using a soluble-oil emulsion, and in this way keep the metals in rubbing contact and under pressure from getting hot enough to seize. The particular cutting operation will have to decide that. High-speed machining operations require quick heat dissipation, and soluble oils are used to advantage, providing limiting factors do not prevent its use. Such limiting factors might be the tendency of soluble oils to rust or corrode the parts of the machine, or to mix with oils required to lubricate machine bearings.

The effectiveness of a soluble oil as a cutting fluid depends upon the following qualities:

1. To form a stable and permanent


Chip
Work piece
"Built-up edge"
Fragment of built-up edge escaping with chip
Fragment of built-up edge escaping with work piece

Cutting oils when properly selected and applied reduce the built-up edge when machining tough metals, reduce temperature and chip pressure, limit tool erosion, and give an accurate cut with the least expenditure of power

emulsion readily at ordinary temperatures with a variety of natural waters.

2. In grinding operations, it should reduce wheel glaze to a noticeable extent, and it should not interfere with the grinding action of the wheel.

3. It should not deteriorate in storage.

4. It should not gum the moving parts of the machine.

5. It should not foam easily.

6. It should have real wetting properties for the metal being machined or ground, and must be harmless to the operator.

When trouble is encountered with the use of soluble oils, it is usually traceable to one of three causes: (1) The hardness of the water, (2) acidity in the system, and (3) inversion of the emulsion. The latter is caused by a gradual loss of water by evaporation from the emulsion, thereby producing a mixture so rich in oil that the emulsion changes from the usual oil-in-water phase to the undesirable water-in-oil type. The inverted emulsion is slimy and may have a disagreeable odor. Inversion rarely occurs when the emulsion contains ten parts or more of water. Consequently, the percentage of water in soluble oil emulsions should be checked occasionally. This is usually done by breaking up a sample of the emulsion with concentrated hydrochloric or sulphuric acid in a graduated cylinder, and calculating from the separated oil the amount of water necessary to make up for losses.

Most soluble oils emulsify readily with hard water. When necessary to soften the water, it may be done by adding tri-sodium phosphate, using not more than 1½ percent by weight of this alkali. As a rule, less than 1 percent is usually sufficient, except for extremely hard waters. Other alkalies, such as soda ash, borax, may also be used in quantities less than 1 percent by weight. Always soften the water before adding the oil.

Stable emulsions depend upon the alkalinity of the mixture. If marked acidity occurs, the oil separates from the water. If the separation of the oil from the emulsion is not visible, it can be checked for acidity with blue litmus paper. The cause of acidity may be found in some of the previous processing the metal, like pickling.

OILS

Conditions occurring in the machining of many metals demand a cutting fluid with both lubricating and cooling qualities to offset excessive pressures and temperatures. The various oils previously mentioned are used, the selection depending upon the severity of the machining operation.

The viscosity of an oil is important when used as a cutting fluid. In general, the heavier the service, the heavier should be the viscosity, but consideration must be given to the fact that lighter oils are more readily circulated, and will carry away heat faster. For best effectiveness, cutting oils should have a viscosity range of 100–200 Saybolt seconds at 100 F.

Gummy cutting oils hold small chips and other abrasives that gradually work into the bearings and slides of machine tools, causing excessive wear and preventing accurate work.

The aseptic properties of cutting oils are also important. The oils should be absolutely free of bacteria, or bacteria-forming media, and be maintained so throughout their use.

Under certain conditions, the cooling action of the cutting fluid may be a question of volume, rather than relative cooling ability. In other words, a lard or mineral oil, a mixture of these two, or the use of a sulphurized oil may be expected to give the requisite results if supplied in sufficient volume, and properly cooled and clarified after each circulation.

Good grades of cutting oils have penetrating and adhesive properties, thereby promoting their value as cutting fluids. The penetrating quality is important because it enables the oil to enter infinitesimal pores in the cutting tools, thus serving as minute reservoirs to supply a microscopic film of oil on the lip of the tool. Adhesive properties enable the oil to resist the wiping action of the chip which tends to remove it from the surface of the tool. These properties, combined with the lubricity of the oil, reduce friction heat and assist in easy removal of the chips. It is believed that sulphur gives additional penetration to the oil, which is another reason why sulphurized oils are especially adaptable to heavy cutting operations.

AQUEOUS SOLUTIONS

Aqueous solutions are adaptable for many cutting operations, especially grinding. Their cooling ability is their chief advantage, although relatively low cost is attractive.

They are detrimental, however, in that they promote corrosion and rusting of the machine and work. They thin the lubricants necessary for uninterrupted service of bearings, and other machine tool wearing parts. Water and aqueous solutions are poor makeshifts in the reduction of solid metallic friction, since they do not have the viscosity necessary to maintain the lubricating film needed for many cutting operations.

APPLICATIONS OF CUTTING FLUIDS

The selection of a cutting fluid for any given operation must be decided at the point where the work is being done. The decision will have to take the following into consideration: cost, personal preferences, cutting speed, tool hardness, tool shaping, machineability of the metal, and type of machining operation. After these considerations have been disposed of, the principal difference between the types of cutting fluids may be narrowed to the following:

1. Sulphurized mineral oil will be advantageous in many cutting operations on all types of ferrous metals, and especially on tough material of which nickel steel is but one example. These oils are ideally suited to threading operations on all types of steel. Occasionally, objections are raised to their use for machining brass or nonferrous alloys, because of the corrosion action of the sulphur, which turns the surfaces of these metals black, even though such tarnish may be removed chemically after machining.

2. Sulphur-base cutting oils will often be selected for certain steel cutting operations where visibility of the cut surface is an important factor, and for machining low- or medium-carbon steels.

3. Mineral oil, lard oil, mineral-lard oil, or other fatty acid mineral oil combinations are often preferable for moderate speed operations on high-carbon steels, or where an oil is desired that is not likely to stain the work. They are used instead of soluble-oil emulsions where the latter are corrosive to the work or detrimental to the machine parts.

4. Soluble-oil emulsions are used extensively for grinding operations to prevent distortion, assure accuracy, and at the same time permit the grinding wheel to bite into the metal. Recently, however, cutting oils have been used in many plants for grinding operations; these are discussed later.

Soluble oils are often selected for machining operations involving conditions where the need of a first-rate cooling medium at low cost transcends all other considerations.

5. Plain water or aqueous solutions are used, but less extensively than ever before, on such operations as grinding, drilling, sawing, light milling, or turning, where cooling and washing away chips are demanded.

In general, machining operations which produce a curling chip that bears heavily on the tool indicates a tough material which requires sulphurized or heavily compounded oil for best results. If the chip bears hard but breaks off just above the tool, a lightly sulphurized or compounded oil will usually be satisfactory. Friable materials, such as cast iron, which do not produce chips that bear on the tool with any great force, may be cut dry or with a soluble-oil emulsion if the laying of dust is important.

Some typical applications of cutting fluids follow:

SULPHURIZED OILS

Sulphurized oils are now used as all-around cutting fluids for rapid production involving good surface finish and close tolerances.

Light-body oils containing from 2.5 to 3.5 percent added sulphur give the best results when all the following factors are involved:

1. To secure better finish on machined parts and smoother threads, and to overcome loading and scuffing tools or metallic pick-up, when

2. machining stainless steels, alloy steels, monel metal, nickel, iron, copper, tough bronze, low-carbon steels, and steels with low Brinell hardness, during

3. gear roughing, threading, broaching, deep-hole drilling and reaming operations, with

4. heavy feeds when the surface speed is correspondingly low.

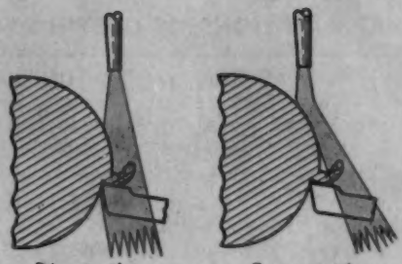
Light-body oil containing from 0.2 to 0.7 added sulphur, the amount being consistent with good finish on machined parts, will give the best results when all the following factors are involved:

1. To secure longer tool life, lower oil cost and transparency, when

2. machining free-cutting steels, high-speed steels, non-ferrous metals, and steels with high Brinell hardness, during

3. high-speed automatic screw machine, gear finishing, thread milling, turret lathe, drilling and milling operations, with

4. light feeds when the surface speed is correspondingly high.



Direct the cutting fluid on the work and tool

Be sure the cutting fluid does not deflect from the work and tool

Simple though it may seem to direct cutting fluids on the work properly, it is frequently done incorrectly. Resultant troubles are often and improperly assigned to the cutting fluid

STRAIGHT MINERAL OILS

Straight mineral oils are used extensively on complex machines, such as automatic screw machines, which require tool lubrication when machining free-cutting steel or brass. They are suitable for light machining of some tough steels, and for tapping and threading of white metals.

When cutting, drilling and tapping leaded or free-cutting brasses, a light machine oil, sometimes known as pale paraffin oil, having a viscosity of about 100 sec. Saybolt at 100 F., is used.

MINERAL-LARD OILS

The percentage of lard oil necessary in a mineral-lard oil blend will depend on the depth of cut, the cutting speed, the feed and type of chip; the latter will give a fair indication as to the degree of lubrication required. In general the amount of lard oil in the blend is increased with increase in hardness of stock, or where deep cutting is essential.

High-carbon and alloy steels may be cut, threaded, or milled with a cutting fluid made up of one part sulphur-base oil, and nine parts light mineral oil. A mixture of lard oil and turpentine in varying proportions is used for machining hard steel and for drilling.

When cutting and machining low-carbon steel, one part of sulphur-base oil with 15 to 20 parts of light mineral oil may be used. Likewise, a cutting fluid composed of approximately 90 percent mineral oil, maximum free fatty acid content 3.5 percent, will be found satisfactory.

For non-leaded brasses, mixtures varying from 75 to 90 percent machine oil with 25 to 10 percent lard oil, respectively, are used. For copper, three parts mineral oil and one part lard oil, or one part sulphur-base oil and ten parts of light machine oil may be used.

Lard oil and kerosene or turpentine in varying proportions are used for machining aluminum, very hard steel, and drilling glass. For cutting ordinary aluminum, a solution composed of 50 percent kerosene, 40 percent lard oil with a low free fatty acid content, and 10 percent of a chlorinated solvent, may be used. For free-machining aluminum, mineral-lard oil with 25 percent lard oil may be used, especially on heavy cuts and for threading.

Magnesium and its alloys can be machined with cutting fluids composed of equal parts of kerosene and pure lard oil.

EMULSIONS

When soluble-oil emulsions are used for machining high-carbon and alloy steels, where heat transfer and chip removal are of primary importance, a solution of one part soluble oil to nine parts water can be used on turret lathes, screw machines, and gear hobbers. For low-carbon steel, the ratio can be one part soluble oil to nineteen parts water.

Leaner mixtures may be used on simple turning or drilling operations. Very lean mixtures, such as 1–50 or 1–100 may be used on some drilling and most grinding operations. The range of mixtures for various operations are summarized below, wherein the letter *W* indicates water, and the letters *SO* indicate soluble oil:

Turning and boring	10–30W + 1SO
Threading	10–20W + 1SO
Drilling	20–50W + 1SO
Cold sawing	10–30W + 1SO
Milling	10–30W + 1SO
Screw cutting	15–25W + 1SO
Automatics	15–25W + 1SO
Broaching	5–20W + 1SO
Gear hobbing	5–20W + 1SO
Grinding	40–100W + 1SO

The ideal ratio for any machining operation can, of course, only be determined by repeated experiments.

In the final analysis, selection of a satisfactory cutting fluid requires wholehearted cooperation between the supplier of the cutting fluid and shop personnel. The keeping of careful records of performance in each plant is probably one of the best ways to arrive at the best operating conditions.

OILS FOR GRINDING

Recent experiments have shown that in some instances oil assists in an improved grinding finish. The advantages of using oil are:

1. Reduced loading, which calls for

TYPICAL APPLICATIONS OF CUTTING FLUIDS [1]

	Group 1	Group 2[2, 3]	Group 3[3]	Group 4[3]	Group 5	Group 6
Automatics....	90K + 10M 50K + 50M SML (1–3) LM	20–25W + 1SO M + (5–10)L LM	20-25W + 1SO M + (10–20)L SM-SML (3–4)	5-15W + 1SO M + (10–20)L SM-SML (3–4)	....	15–20W + 1SO M + (10–15)L SM-SML (1–2) LM
Boring, turning.....	90K + 10M 50K + 50M SML (1–3) L (note A)	20–25W + 1SO M + (5–10)L LM	15–20W + 1SO M + (10–20)L SM-SML (3–4)	5–15W + 1SO M + (10–20)L SM-SML (4)	20–30W + 1SO SM-SML (1–3) LM	20–25W + 1SO M + (10–15)L SM-SML (1–4) LM
Broaching.....	90K + 10M 50K + 50M SM-SML (1–2)	20–25W + 1SO LM	5–15W + 1SO SM-SML (3–4) M + (10–20)L	5–15W + 1SO SM-SML (3–4)	10–20W + 1SO SM-SML (1–3) M + (10–15)L LM	10–20W + 1SO SM-SML (1–3) M + (10–15)L LM
Drilling.....	90K + 10M 50K + 50M SM (1–2) 20–35W + 1SO	20–30W + 1SO LM	15–25W + 1SO SM-SML (2–3) M + (10–20)L	5–15W + 1SO SM-SML (2–4)	25–40W + 1SO SM-SML (1–3) LM	15–25W + 1SO SM-SML (1–3) M + (5–15)L LM
Reaming.....	90K + 10M 50K + 50M SM-SML (1–2)	20–25W + 1SO M + (5–10)L	M + (10–20)L SM-SML (2–3)	5–15W + 1SO SM-SML (3–4) M + (10–20)L	10–20W + 1SO SM-SML (2–3) M + (10–15)L LM	10–20W + 1SO SM-SML (1–3) M + (10–15)L LM
Honing.....	K or WSK	K or WSK	K or WSK	K or WSK	K or WSK	K or WSK
Lapping.....	K Note B	Sperm oil Note B	Sperm oil Note B	Sperm oil Note B	Sperm oil Note B	Sperm oil Note B
Grinding[4].....	K or WSK	K or WSK 120W + 1SO W or AS	K or WSK 120W + 1SO Min. seal oil	K or WSK 100W + 1SO Min. seal oil	50–90W + 1SO W or AS	40–60W + 1SO LM AS
Planing, shaping.....	90K + 10M 50K + 50M SML (1–2)	20–25W + 1SO M + (5–10)L LM	15–20W + 1SO M + (10–20)L SM-SML (2–3) LM	15–20W + 1SO SM-SML (3–4) LM	20–30W + 1SO SM-SML (1–3) LM	20–25W + 1SO M + (10–15)L SM-SML (1–4) LM
Milling, hobbing.....	90K + 10M 50K + 50M SM-SML (1–2) 20–35W + 1SO	20–25W + 1SO M + (5–10)L LM	15–20W + 1SO M + (10–20)L SM-SML (2)	5–15W + 1SO M + (10–20)L SM-SML (3–4)	Note C 20–30W + 1SO SM-SML (1–3) LM	15–25W + 1SO SM-SML (1–3) M + (5–15)L LM
Sawing.....	90K + 10M 20–35W + 1SO	20–30W + 1SO M + (10–20)L LM	20–30W + 1SO M + (10–20)L SM-SML (3)	10–20W + 1SO M + (10–20)L SM-SML (3–4)	20–30W + 1SO LM	20–30W + 1SO M + (10–20)L SM-SML (2–3) LM
Die threading, tapping.....	Note D 50K + 50M SML (2–3) L (Note A)	M + (5–10)L LM	M + (5–10)L SM-SML (3–4)	M + (5–10)L SM-SML (3–4)	M + (10–20)L SM-SML (2–3)	M + (10–20)L SM-SML (2–3) ....
Turret lathe....	90K + 10M 50K + 50M SM-SML (1–3)	20–25W + 1SO M + (10–20)L	20–25W + 1SO M + (10–20)L SM-SML (2–4)	5–15W + 1SO M + (5–10)L SM-SML (3–4)	20–30W + 1SO SM-SML (1–3) LM Note C	20–25W + 1SO M + (10–15)L SM-SML (1–4) .....

Group 1—Aluminum and aluminum alloys; aluminum and zinc die castings.
Group 2—Brass.
Group 3—Bronze.
Group 4—Copper, everdur, inconel, monel, nickel, tough bronze.
Group 5—Wrought and malleable iron.
Group 6—Low-carbon and free-cutting steels.
Group 7—Medium-carbon and tough low-alloy steel.
Group 8—High-carbon high-alloy steels, including high chromium, manganese, high-speed and stainless.

Legend: W = Water.
K = Kerosene.
M = Mineral oil.
AS = Aqueous alkali solution.
ML = Mineral-lard oil.
LM = Straight mineral oil.
WSK = Water-soluble kerosene.
SM = Sulphurized mineral oil.
SML = Sulphurized mineral lard oil.
L = Lard oil.
SM-SML = Sulphurized mineral or sulphured-base mineral-lard oils.

90K + 10M = 90 parts kerosene + 10 parts mineral oil.
20W + 1SO = 20 parts water to 1 part soluble oil.
M + (10–20) L = Mineral oil + 10 to 20 parts lard oil.

Numbers in parentheses indicate cutting strength, number (6) being the strongest.

[1] A careful analysis of each specific job must be made before cutting fluid specifications can be established. If shop records do not indicate the proper fluid to use, consult the suppliers of cutting fluid.

[2] Where sulphur bearing cutting oils are used with copper-bearing alloys, the problem of tarnish has to be considered.

[3] For free and semi-free cutting brass, to which some element has been added to improve cutting qualities, a light mineral oil can be used when a cutting fluid is required as, for example, on automatic screw machine work.

[4] Special soluble-oil emulsions, processed to free themselves of grit, are available.

Group 7	Group 8
10–15W + 1SO M + (10–15)L SM-SML (2–4) LM	5–10W + 1SO M + (10–20)L SM-SML (3–4) .....
15–20W + 1SO M + (10–15)L SM-SML (2–4) LM	5–10W + 1SO M + (10–20)L SM-SML (3–4) LM
10–15W + 1SO SM-SML (2–4) M + (10–20)L LM	5–10W + 1SO SM-SML (3–4) M + (10–20)L LM
10–20W + 1SO SM-SML (2–4) M + (10–20)L LM	..... SM-SML (3–4) M + (10–20)L LM
10–15W + 1SO SM-SML (2–4) M + (10–20)L LM	5–10W + 1SO SM-SML (3–4) M + (10–20)L .....
K or WSK	K or WSK
Sperm oil Note B	Sperm oil Note B
40–60W + 1SO LM AS	50–75W + 1SO LM AS
15–20W + 1SO M + (10–15)L SM-SML (2–4) LM	5–10W + 1SO M + (10–20)L SM-SML (3–4) LM
10–20W + 1SO SM-SML (2–4) M + (10–20)L LM	..... SM-SML (3–4) M + (10–20)L LM
15–25W + 1SO M + (10–20)L SM-SML (2–3) LM	15–20W + 1SO M + (10–20)L SM-SML (2–4) LM
M + (10–20)L SM-SML (3–4)	M + (10–25)L SM-SML (4) ....
15–20W + 1SO M + (10–15)L SM-SML (2–4)	5–10W + 1SO M + (10–20)L SM-SML (3–4) .....

NOTES:

A—For some operations requiring heavy cuts, straight lard can be used.

B—Oil-base suspension compounds, which are abrasive carriers, are available from some cutting fluid suppliers.

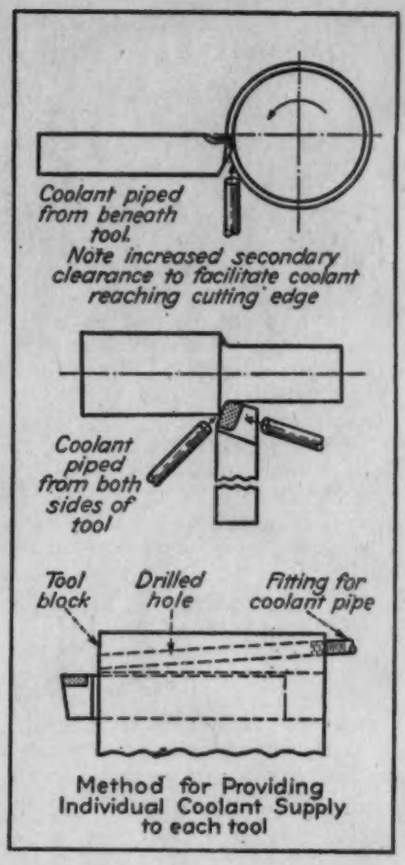
C—A mixture of white lead and 30-percent lard oil may be used.

D—Beeswax or mixture of beeswax, gasoline and turpentine made into a paste is used frequently.

Magnesium and its alloys should be machined only with oil-type cutting fluids. Vegetable oils, however, are not recommended. Emulsions should not be used since water oxidizes the chips, thereby increasing the fire hazard encountered when machining this metal.

For high-nickel alloys, sulphurized oils give best results. This type of oil may slightly discolor the work, but tarnish is readily removed by soaking the work for 20 or 30 minutes in a cold 10-percent solution of sodium cyanide.

Traces of cutting fluids should be removed from parts if in later fabrication they are subjected to high temperatures.


Coolant piped from beneath tool.
Note increased secondary clearance to facilitate coolant reaching cutting edge
Coolant piped from both sides of tool
Tool block
Drilled hole
Fitting for coolant pipe

Method for Providing Individual Coolant Supply to each tool

High cutting speeds possible with carbide-tipped tools require increased cutting fluid capacity and flow. The fluid must be directed so the fast moving chips will not carry it away from the tool. Three satisfactory methods of applying the coolant are shown here

fewer dressing and results in longer wheel life.

2. Finer wheels to remove the required stock, producing a finer finish, allowing lighter dressings, and better maintenance of the wheel form.

3. Improved luster due to smoother cutting action.

4. Reduced power due to reduced friction.

There are certain limiting factors, however, with the use of oil:

1. The parts become hotter due to inability of oil to carry away heat as readily as water.

2. Oils are conducive to the production of fumes and spray.

3. Oils become contaminated, due to slower settling of chips.

4. Loss from splashing may be high.

The foregoing objectionable features may be minimized as follows:

1. Heating of the work may be overcome by restricting the use of oils to limited stock removal or intermittent cuts, by using large volumes of oil, or by making allowance for oversize due to expansion.

2. Since the amount of fumes is related to the amount of heat generated, or indirectly to stock removal, they also can be reduced by using large volumes of oil, or by restricting oils to jobs with limited stock removal or intermittent cuts. In addition, they can be eliminated by installing exhaust systems.

3. Contamination can be avoided by using larger settling tanks, or by employing centrifugal separators or filters.

4. Loss from splashing can be minimized by installing splash guards.

With the exception of resinoid wheels used on some thread-grinding operations, successful applications of oil seems to be confined to use with vitrified wheels. In some cases, the use of oil with fine vitrified wheels has shown definite improvement over organic bonded wheels with water coolant. Where rubber or shellac bonded wheels have been tried, with oil as the cutting fluid, the results have not been satisfactory.

Often, when using oil for grinding, the practice has been abandoned because of objectionable scratches in the work. It is likely that this may be due to inadequate settling tanks or the lack of suitable filters, and that the oil retains grinding chips in suspension which affects the surface finish. It is also possible that the objectionable scratches were made more apparent because the general finish with oil was better.

FLUIDS FOR CARBIDE TOOLS

Usually, increased cutting fluid capacity and flow are required when machining with carbide-tipped tools, because of the very high speeds at which machines can and should be operated when cutting with such tools. Not only should the pump have sufficient capacity to supply large volumes of the fluid under sufficient pressure to cool the tool and work adequately, but the cutting fluid must be so directed that it will not be carried away from the tool by the fast-moving chip. Several ways of directing the fluid are shown in one of the drawings.

The prime requisite of a cutting fluid for use with carbide-tipped tools is cooling quality. A good soluble oil works well. Cutting oils are used, but in some cases are objectionable because of smoke developed. It is reported that straight cutting oils are not good coolants at speeds in excess of 200 surface feet per minute; however, where chip pressures are high, and lubricating qualities of oils are desirable, large volumes can be used to enhance cooling.

HANDLING CUTTING OILS

Storage, distribution and reclamation are the three principal factors involved in handling cutting oils. The first two are individual shop problems, but the third is not contingent on local conditions, because the type of oil and nature of the chips must be considered.

The first step in reclamation is the handling of chips. Even though individual machine tools may provide for drainage of cutting fluids to a sump, the chips will retain an appreciable amount of oil. These should be taken to a settling tank or centrifugal chip extractor to reclaim such oil and render it adaptable to re-use or further treatment in a filter or purifier.

Where more than one grade of cutting fluid is used, chips and parts produced with the different fluids should be handled separately, care being exercised to prevent mixing of stocks.

Oil reserve tanks should not be located where their contents can be subjected to sub-zero temperatures during winter. Cold oil will not mix readily with make-up stock. Furthermore, ingredients added to the mineral base to improve cutting qualities may separate from the mineral base and will not go back into perfect mixture when the oil is brought to normal temperature, except perhaps after prolonged heating and stirring.

Each machine on which cutting fluids are used should be cleaned frequently to remove sediment and deposits of old fluid. Some plants recommend cleaning machines once a week.

RECONDITIONING

Cutting fluids can be purified or filtered readily after they have become contaminated in service. Reconditioning equipment may involve a centrifugal chip extractor and oil purifier, or a chip settling tank with suitable oil filter. Oil may be delivered from the machines by hand or truck and treated periodically, or piping can be installed to enable continuous purification.

Ordinary filtration and centrifuging machines are not always capable of removing minute metallic particles from cutting oils. Where straight oils are used, heating will reduce the viscosity sufficiently to permit the metal to sink to the bottom of the settling tank. In the case of soluble oils and those containing sulphur, high-speed centrifuges will remove very fine particles of metal from compounds heated to 150 F.

Advantages of using reconditioning equipment, especially the continuous types, are:

1. Cost of cutting fluids can be reduced with relatively small increase in cost of plant equipment.
2. Cutting tools receive maximum protection since the oil is kept free of chips, scale and dirt.
3. Clean oils reduce tool wear, thereby increasing tool life between resharpenings, promoting continuous production, decreasing machine power consumption, increasing cutting speed, and promoting accuracy of the machined part.
4. Oil temperatures are reduced with the result that not only the cooling, but also the lubricating value of the oil is enhanced. Furthermore, by maintaining a cutting oil at lower temperature, the tendency towards oxidation, development of acidity, and possibility of gumming are reduced.
5. Considerable labor is saved since manual filling and emptying of oil tanks are eliminated.
6. Shop cleanliness is promoted, since reclaiming systems where oil is pumped to the machine eliminates the dripping and spilling of oil on the floor.

PREVENTION OF INFECTION

Certain types of oils, especially those which contain fatty ingredients, will have a tendency to become bacteria infected and develop into carriers of disease. Also, rancidity of lard oil, the development of free fatty acids, the presence of finely divided metallic particles, poor refinement of mineral-oil constituents, or the presence of certain chemicals used in refining have, in the past, been regarded as the most prevalent causes of skin irritation. However, very few well-refined oils will contain irritating ingredients, and during use contamination can be minimized by centrifuging.

Germs responsible for contamination frequently come from sources other than the oil, such as spitting or depositing organic impurities like food refuse in the oil pans; also, certain types of water used in soluble-oil emulsions cause bacterial growth, particularly water high in magnesium sulphate.

Infection among machine operators is not always due to the presence of bacteria in the oil. There are contributing causes, such as poor physical condition of the operator and the tendency of oil to dissolve fats from the skin to leave it dry and liable to crack or chap.

Feasible ways of counteracting development of skin infections are:

1. Personal cleanliness among operators, and a generous use of soap and a scrubbing brush or soft abrasive material when washing.
2. Careful purification and filtration of oils to remove contaminating foreign matter.
3. Immediate care of skin abrasions, since germs entering cuts will cause septic infection.
4. The addition of disinfectants to the oil to reduce germ content. The use of too much disinfectant is harmful to both the operator and the metal. Reliance cannot be placed on them unless careful control is exercised over their use by a competent bacteriologist. Various antiseptics have been added to prevent rashes, the most popular being carbolic acid, 2 percent being added to straight oils, and 0.5 percent of a disinfectant soluble in water in case of emulsions.
5. Sterilization by heat to kill bacteria. Complete germicidal action can usually be obtained with a temperature of 245 F., although lower temperatures may be used if tests indicate a sufficient reduction in bacteria count.
6. Operators contracting skin infection should be removed immediately from contact with the cutting fluid. This is doubly important where the machines are supplied with cutting fluid from a central source.
7. When the cutting fluid becomes contaminated, and it is necessary to discard it, the reservoir, pipe lines, machine, pumps and other equipment used in handling it should be cleaned with hot water treated with a strong disinfectant. Otherwise, germs remaining in the system will quickly contaminate the new supply of cutting fluid.

The U. S. Public Health Service and National Safety Council suggest the following as additional aids to prevent skin infection:

1. At work use an apron or smock of closely woven cloth, leather, or other substance that sheds oil.
2. Before and after work wash with warm water and liquid green soap. If difficulty is encountered in removing oil and dirt, use green soap and sawdust, the latter being used instead of a brush.
3. Do not permit clothing to become soaked with cutting fluid. In any event, change to clean clothes at least once a week.

Splash guards, armlets, and gloves, the latter being used when safety permits, afford protection against flying chips. They should be made of oilproof material and not allowed to become dirty, loose or ragged.

Armament

SECTION OF AMERICAN MACHINIST

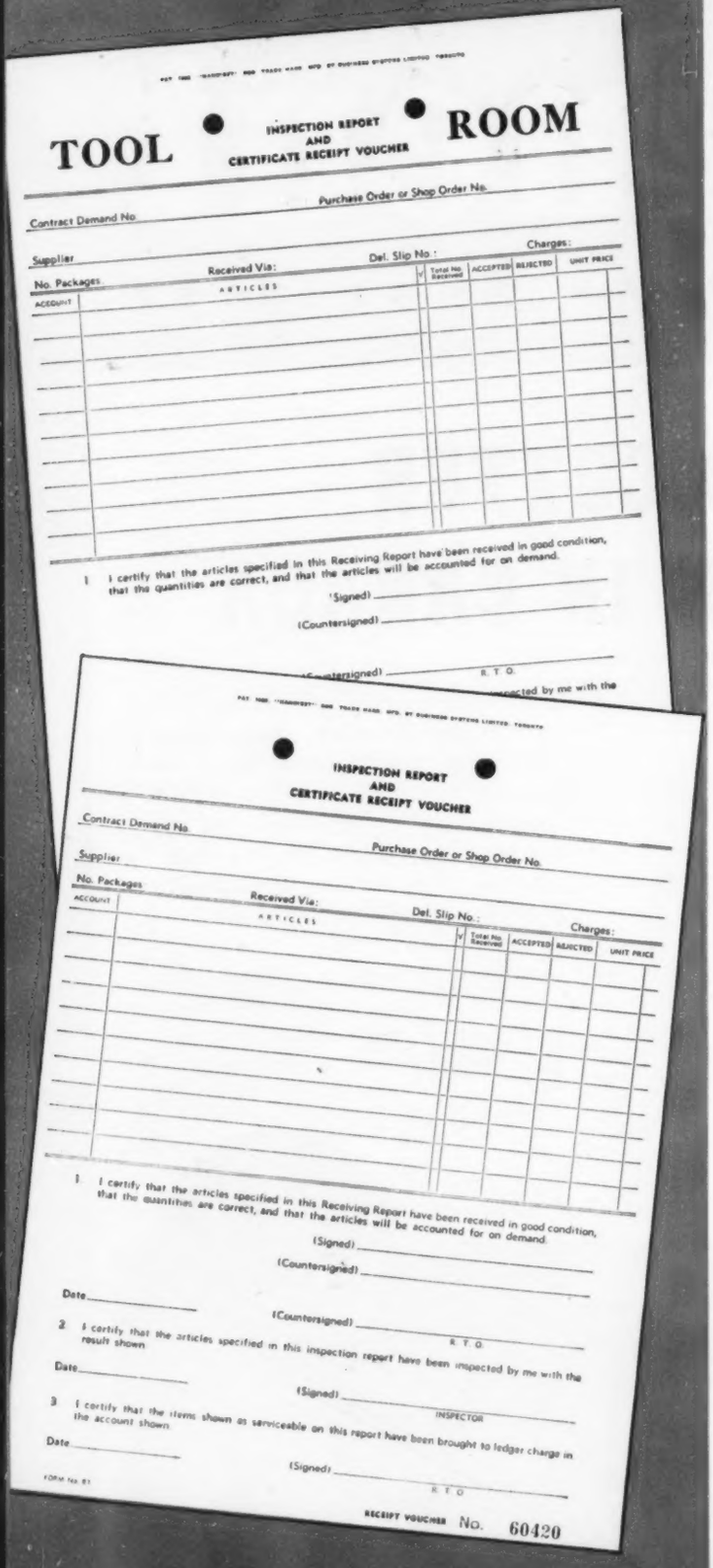
GAGE AND CUTTER CONSERVATION IN CANADA

ECONOMIC USE of cutting tools and gages in one of Canada's largest small arms plants involves problems of control and application not common in most peacetime plants. First of all, three separate guns are being manufactured in fairly large quantities. These are the Bren light machine gun, which requires nearly 3,000 operations on 161 component parts; an aircraft model of the cal. 0.303 Browning machine gun, with about 2,100 operations on 176 components; and the recently developed Boys anti-tank rifle, requiring 1,200 operations on 124 components. In all, more than 5,000 machining operations are included in the 6,300 operations necessary on the three guns. Not only must gages be provided for all operations, but cutters of many sizes and types are necessary in large quantities in order to get into production and then have a reserve for sharpening and breakages.

Every effort has been made to train the machine operators, bench fitters and assemblers, and inspectors in the proper care of precision tools and gages. In addition a gage control department has been organized to provide a constant check on the accuracy and the proper application of all gages used in the plant. Similarly, a cutter control department has been set up to see that cutters are properly designed, used and kept in condition.

The gage control department is charged with (1) the maintenance of all gages in good condition to insure the manufacture of parts within acceptable

Every effort has been made to train machine operators and inspectors in the proper care of precision tools and gages. A gage control department keeps a constant check on the accuracy of all gages used in the plant. As an example of the problem involved, 69 gages are required for the first major inspection of these Bren breech blocks, 72 for the second major examination, 36 for the third and 56 for final inspection operations



TOOL ROOM

INSPECTION REPORT AND CERTIFICATE RECEIPT VOUCHER

Contract Demand No. Purchase Order or Shop Order No.

Supplier Received Via: Del. Slip No.: Charges:

No. Packages ARTICLES Total No. Received ACCEPTED REJECTED UNIT PRICE

ACCOUNT

1. I certify that the articles specified in this Receiving Report have been received in good condition, that the quantities are correct, and that the articles will be accounted for on demand.

(Signed)

(Countersigned)

(Countersigned) R. T. O.

INSPECTION REPORT AND CERTIFICATE RECEIPT VOUCHER

Contract Demand No. Purchase Order or Shop Order No.

Supplier

No. Packages Received Via: Del. Slip No.: Charges:

ACCOUNT ARTICLES Total No. Received ACCEPTED REJECTED UNIT PRICE

1. I certify that the articles specified in this Receiving Report have been received in good condition, that the quantities are correct, and that the articles will be accounted for on demand.

(Signed)

(Countersigned)

Date (Countersigned) R. T. O.

2. I certify that the articles specified in this inspection report have been inspected by me with the result shown.

Date (Signed) INSPECTOR

3. I certify that the items shown as serviceable on this report have been brought to ledger charge in the account shown.

Date (Signed) R. T. O.

FORM No. 81

RECEIPT VOUCHER No. 60420

Separate report forms are made up by the receiving department for all fixtures, cutting tools and gages purchased from outside suppliers and those made in the toolroom. These forms are identical, except for the designation of the toolroom form

limits, (2) the maintenance of an adequate supply of gages in accordance with production requirements wherever possible, and (3) the keeping of accurate records of the condition and movements of all gages. The control procedure employed by this department has been modified from time to time to suit the nature of the work being done in the plant, and still is being revised as improvements in method become desirable. Already, improvements in gages and gaging practice have been developed which have reduced rejects and rework on both gages and product appreciably, and toolroom costs on certain types of gages have been reduced through improved designs. Gages of "built-up" design are used wherever possible, in order that size can be maintained, or changed to a new dimension, by grinding one or two surfaces.

Set up as a division of the inspection department, the gage control department employs three classes of help. These are: (1) inspectors, who are responsible for the accurate checking of gages, the condition of the inspection equipment, and the supervision of all records kept by the department; (2) chasers, who are responsible for the proper movement of gages to and from the inspection groups in the production departments and all other departments concerned; and (3) clerks, who keep all records, files, prints and documents in order, and assist in the inspection and movement of gages if necessary.

Checked in Constant Temperature Room

All new gages, whether purchased from outside suppliers or made in the toolroom, first go to the receiving department, where they are given a visual inspection to detect damage during transit. Then the individual items are listed by a clerk on the "Inspection Report and Certificate Receipt Voucher" shown, drawings of the tools are attached, and they are delivered with this report to the inspection department's air-conditioned, constant-temperature "standards" room where they are checked for accuracy of size and operation. There are two inspection report forms, one for items purchased on the outside, and the other for items made in the toolroom. Ten copies are made of the first form, while only six are necessary for the toolroom inspection and receipt form.

Fixtures, tools and gages accepted by the "standards" room go direct to the main tool storeroom where each is marked with its tool number. In the case of gages, where several duplicate gages may carry the same tool number, each is etched with a "control" number that serves to identify that individual gage throughout its useful life. This control number is circled to set it apart from the regular tool number. This control number is never assigned to another gage, even if the original gage bearing this number is de-

stroyed. Gages are requisitioned from the main storeroom by the senior inspector in charge of a production inspection group as required. While on the production floor, whether being used by machine operators or inspectors, all gages come under the immediate control of the senior inspector.

In the standard procedure set up by the gage control department, production requirements are taken as the minimum quantity required on the production floor as indicated by operation sheets, plus those required for the various scheduled inspection operations. Spares or replacements are not included in this total. Where a larger quantity is required for additional operators or machines, it must be reported on a daily gage control report form before any adjustment can be made.

A "working supply" quantity of gages is set up for gage control purposes. This quantity consists of a minimum quantity required for production, plus one gage, in the case of all ordinary gages, so that one or more gages can be "floating" through gage control inspection or stores to absorb time lag without impeding production. Extraordinary types of gages which cannot be included in this class are dealt with separately.

The storekeeper posts the "working supply" quantity of gages on bin cards, and once this quantity has been issued will refuse any further issue without a voucher or direct order from gage control. The storekeeper issues, if possible, any gage having a particular control number which may be required by production within the limits of the "working supply."

For the purposes of gage control, "minimum supply" quantities are taken as those quantities below which the total available or active stock should not be allowed to drop (available or active stock being the sum of gages on production and in stores), in order to insure an adequate supply commensurate with production requirements. This minimum supply quantity is not to be confused with the working supply quantity, as it includes the few replacement gages carried in stores as replacements. When setting up a minimum supply quantity for any gage, the gage control department takes into consideration the length of time necessary to procure additional gages, the plan being to insure that a proper number of gages always will be on hand to meet production requirements.

Gages needed for production operations, or by inspectors, are requisitioned from the mail tool store-

Form M-11

DAILY GAUGE CONTROL REPORT

Component No. _____ Dept. No. _____ Clerk _____ Date _____

The following gauges are ready for checking:

Gauge No.	Mark	Operation	Frequency	Accumulated Record	Remarks	Date

Gages ready for periodic checks, or subject to abnormal wear, are reported on this form. Occasionally gages must be redesigned

Whether purchased or made in the plant's toolroom, all jigs, fixtures, cutting tools and gages go to the inspection department's air-conditioned "Standards" room for checking before delivery to the storekeeper. Temperature in this room is maintained at 66-69 F., with 35 to 40 percent relative humidity

GAUGE CONTROL REPORT

Gauge No. ..... Detail .....

Inspector ..... Date .....

DIMENSIONS:

Accept
Reject ..... Sr. Inspector

Form 225

Tickets showing dimensions checked are attached to all gages passed through the gage control department. The shop inspector then indicates whether the gage is acceptable

Repair and Replacement Voucher № 57345

Account No. ..... T. T. No. .....

Quantity ..... Part No. ..... W. O. No. .....

Article ..... Detail No. .....

Used at ..... Operation .....

Reason for returning to Stores .....

Returned by ..... Clock No. ..... Date .....

Comments .....

Department Foreman

Received at Stores ..... Date .....

Order Replaced / Repaired by ..... Deliver to .....

Instructions .....

Repairs completed by ..... Clock No. .....

Work started ..... Work completed ..... Hrs. ..... Rate .....

Date ..... Total .....

Repaired Article Inspected by ..... Inspector

Received in Stores by .....

Purchasing Department's Comments .....

Scrap ..... Return for Credit to: .....

Shipping Order No. .....

Inspection Instructions .....

Rework to New Tools ..... Scrap .....

Inspector

No. .....

Form 11 (Revised)

Gage repairs or replacements are ordered on this form. It is initiated by the gage control department after the gage has been inspected. Cause of breakage or damage is indicated as "carelessness" (dropped or misapplied) or "accidental" (unsuitable design or heat-treatment)

All gages returned to stores are checked by an inspector in the gage control department. Tickets showing dimensions are attached to each gage

room by the senior inspector of the department, up to the limit of the working supply. Any difficulties with gages, due to abnormal wear and tear, inadequate supply or replacements, close tolerances, unsuitable designs, or wrong heat-treatment, are reported on a daily gage control report form. This form also is used for requesting a larger working supply of gages in order to provide for increases in production facilities. These reports are analyzed by the gage control department, and steps are taken by this department to correct any unsatisfactory conditions.

The cumulative production record for each operation, which indicates the number of pieces checked by each gage, is kept by a clerk in each production department. Based on this production record and his experience with each type of gage, the senior inspector in the department determines a "frequency" quantity of parts to be checked before the gage automatically is returned to the storekeeper for a check by the gage control department inspectors. While the goal is a periodic check for each gage on production, it has been found impossible to achieve this end because of several factors, the chief of which is an inadequate supply of gages. However, every effort is being made to correct this condition, and in the meantime periodic checking is being introduced gradually at the discretion of the senior inspectors. This method insures, at least, that the most troublesome gages are dealt with first, and receive the most attention.

All gages returned to the storekeeper for any reason

Wherever possible, worn or damaged gages are routed to the toolroom for repair. Sometimes obsolete gages can be reworked to suit another part or operation

The gage control department keeps a card file record for each gage in the plant. Each time some action is taken regarding a gage, the facts are posted on its card. The control number for the gage is shown in the circle at the upper right

are routed through the gage control department's inspection group. Here, dimensions that are different from those shown on the gage drawing are shown on an inspection report ticket for the information of the senior shop inspector involved. This inspector must indicate on the ticket whether the gage is accepted or is to be rejected. Rejected gages then are returned to the gage control department and a repair-or-replacement voucher is issued. Accepted gages for immediate use are kept on the floor, while those for future use are returned to the storekeeper with the properly signed tickets. All acceptance tickets are returned to the gage control department for posting by the storekeeper.

All requisitions for repair or replacement of gages are initiated by the gage control department on the "Repair and Replacement Voucher" form shown. Chasers take these forms to the proper shop supervisors and senior inspectors for signature, and then deliver them to the storekeeper for posting and adjustment of charge records.

All gages returned to stores on these vouchers, whether for repair or replacement, are deducted from transfers and responsibility for physical inventory passes, thereby, from the inspection department to the stores department. Reasons for rejecting the gage must be clearly indicated on this form. It is the responsibility of the gage control department to advise as to methods in the case of repairs, and as to quantity to be ordered in the case of replacement. Vouchers for

FORM 140
DET. No. _____ OPS _____ GAUGE No. _____

DATE	DISPOSITION & REMARKS	FREQUENCY _____	INSP. BY

lost gages must be signed by a responsible person in the department concerned in order to insure reduction of such losses to an absolute minimum.

No gage now is scrapped, unless of no further use whatever, and a salvage department has been set up to take care of worn and obsolete gages. In order to make this salvage department effective, a definite procedure has been established whereby gages can be, to some extent, automatically reclaimed. Worn gages, on which a minimum supply has been set up, and which have been replaced from stock, made up the bulk of salvage stock. When purchase requisitions are issued, it is first ascertained whether the gages can be plated up or reground from worn or obsolete stock. This is accomplished by routing the purchase requisitions from stores through the gage salvage department. In this connection, considerable experimental

work has been done in connection with chrome-plating certain types of gages. In some cases the useful life of the gage has been increased about three times by chrome-plating.

Control Procedure Keeps Cutters Available

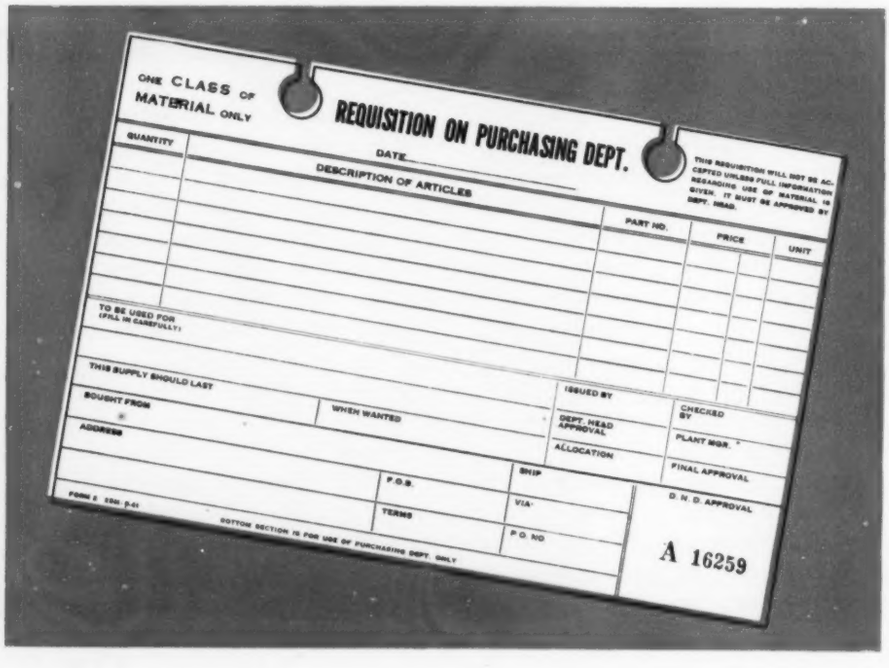
More than 5,000 machining operations are involved in the manufacture of the Bren and Browning machine guns and the Boys anti-tank rifle. Most of these are milling operations, while the rest require broaching cutters, single-point tools, drills, reamers, counterbores, and other cutting tools. Many of the operations involve more than one cutting tool, and in many cases a number of machines are set up to perform the same operation. The problem of keeping an adequate supply of cutters available for all of these operations is no light task.

This responsibility is centered in the hands of the tool supervisor, who works in close cooperation with the production department and the tool design department to insure that an adequate supply of cutting tools is available for each of the several operations.

The tool supervisor is responsible for (1) the functional design of all cutters, (2) the approval of all purchase requisitions for cutters, (3) the approval of all orders for change of cutters because of change of part design, (4) the establishment of standards of efficiency for cutters, (5) the establishment of quantities of cutters necessary for a working supply, a minimum reserve stock and the number of cutters on order to maintain the first two quantities, (6) trouble-shooting on cutter problems, (7) the control and direction of cutter inspection at the several cutter grinding cribs, and (8) the control and direction of the cutter salvage department. In addition, he must approve all tool proving reports and is responsible for recommending changes in cutters resulting from a study of each operation and each cutter set-up. A small group of set-up men on the staff of the tool supervisor is constantly in the shop studying individual operations that are giving trouble; the responsibility of these men being to improve the efficiency of these operations. Each operation studied is reported to the tool supervisor on a special form.

The tool design department is responsible for all cutter designs, which are kept as close as possible to standard cutters made by cutter manufacturers in order to insure sources of supply. However, all cutter designs must be approved by the tool supervisor, who has developed special company design standards to suit the various operations involved. The tool design department initiates the original requisition for cutters, but when a minimum supply quantity has been set, orders for replacements are originated by the storekeeper in order to insure maintenance of an adequate quantity to keep production going. In either case, the purchase requisition for cutters is routed to the tool supervisor, who attaches a print of the cutter drawing and then forwards it to the purchasing department. Occasionally, the tool supervisor will recommend a supplier, but in most cases cutters are purchased on the basis of promised deliveries and past experience with suppliers.

Whether made in the company's toolroom or purchased from an outside supplier, all new cutters are delivered to the receiving bench in the reserve storeroom, where cutters are (1) unpacked, (2) checked against the packing slip and the purchase order, (3)


ONE CLASS OF MATERIAL ONLY

REQUISITION ON PURCHASING DEPT.

DATE

QUANTITY | DESCRIPTION OF ARTICLES | PART NO. | PRICE | UNIT

THIS REQUISITION WILL NOT BE ACCEPTED UNLESS FULL INFORMATION REGARDING USE OF MATERIAL IS GIVEN. IT MUST BE APPROVED BY DEPT. HEAD.

TO BE USED FOR (FILL IN CAREFULLY)

THIS SUPPLY SHOULD LAST

BOUGHT FROM | WHEN WANTED | ISSUED BY | CHECKED BY

ADDRESS | DEPT. HEAD APPROVAL | PLANT MGR.

ALLOCATION | FINAL APPROVAL

F.O.B. | SHIP | D. N. D. APPROVAL

TERMS | VIA

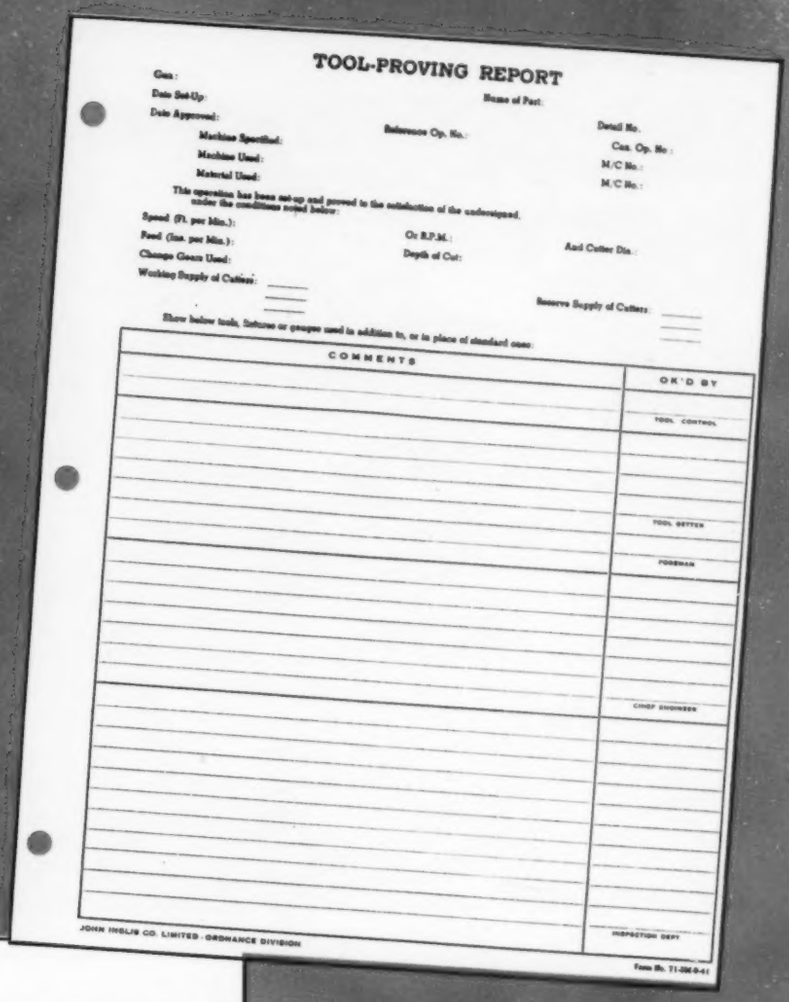
P.O. NO

BOTTOM SECTION IS FOR USE OF PURCHASING DEPT. ONLY

A 16259

All new and replacement gages and cutters are ordered on this form, which is routed to the purchasing department for a decision as to whether the tools are to be purchased or made in the company's toolroom

Each new tooling set-up is given a thorough check by a set-up man on the staff of the tool supervisor, and by the foreman and senior inspector in the production department. Details are reported on this form



TOOL-PROVING REPORT

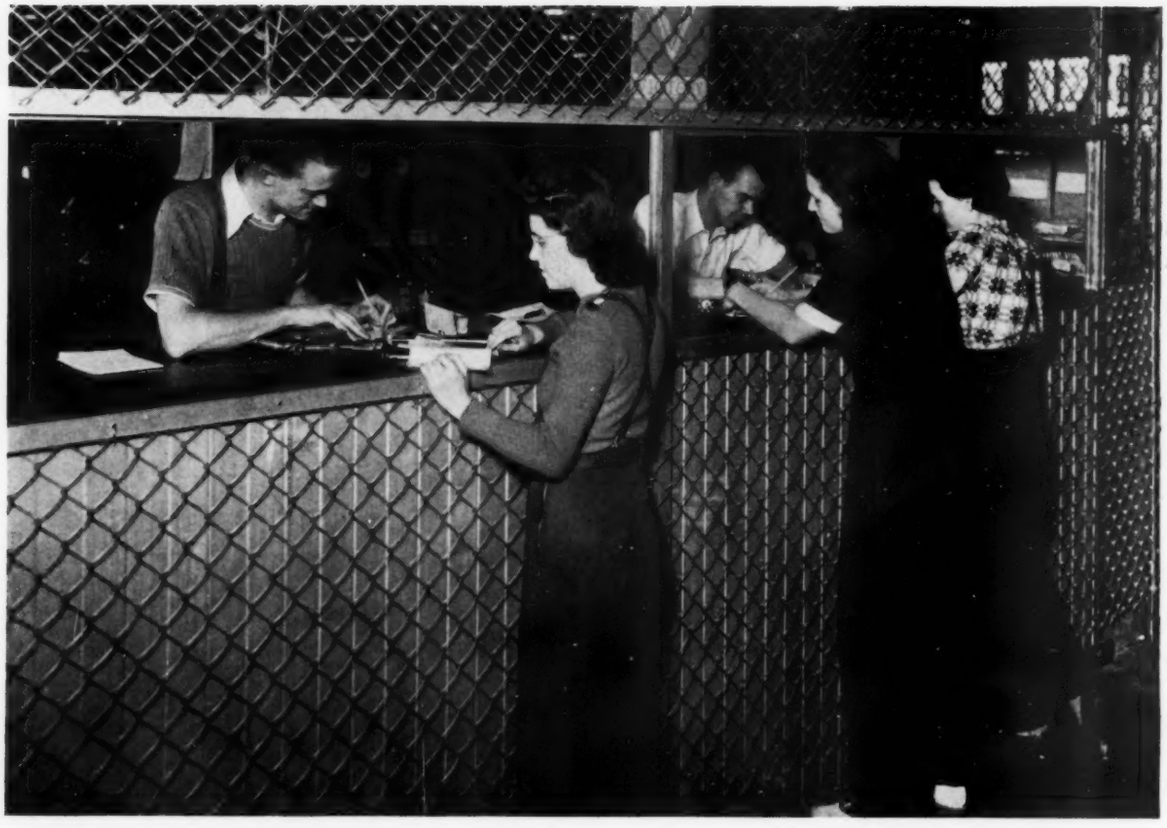
Gun:
Date Set-Up:
Name of Part:
Date Approved:
Machine Specified:
Reference Op. No.:
Detail No.
Gun. Op. No.:
Machine Used:
M/C No.:
Material Used:
M/C No.:

This operation has been set-up and proved to the satisfaction of the undersigned, under the conditions noted below:

Speed (Ft. per Min.):
Feed (Ins. per Min.):
Or R.P.M.:
Depth of Cut:
And Cutter Dia.:
Change Gears Used:
Working Supply of Cutters:
Reserve Supply of Cutters:

Show below tools, fixtures or gauges used in addition to, or in place of standard ones:

COMMENTS	OK'D BY
	TOOL CONTROL
	TOOL SETTER
	FOREMAN
	CHIEF ENGINEER



Sub-stockrooms conveniently located in each manufacturing department keep a supply of cutters on hand for each operation. Beside each of these cribs is a cutter grinding room

Form M-136

WORKING SUPPLY CHANGE FORM

DATE .....

TOOL NUMBER ..... DETAIL ..... OPERATION .....

WORKING SUPPLY ..... PROPOSED WORKING SUPPLY .....

PERMANENT ..... TEMPORARY .....

REASON .....

SUP'T. SIGNATURE ..... FOREMAN'S SIGNATURE .....

When the working supply of cutters for an operation is too low, a change request is initiated by the shop foreman in charge. Each such request is reviewed by the tool supervisor before approval

inspected for damage—frequent cases have been found in which poor packing has resulted in damage to cutting edges during transit, and nicked teeth are of no help when a good finish is necessary, (4) an inspection report form like that used for gages is made out, and (5) the new cutters with this inspection report and a print of the drawing are delivered to the nearby inspection "standards" room for checking.

In inspecting cutters, the first thing checked is the hardness of the cutting surfaces, which is specified on all cutter drawings. Except in special cases, cutter hardness is specified as a minimum of Rockwell C 63 for cutters more than $\frac{1}{8}$ in. wide, while the minimum hardness for cutters less than $\frac{1}{8}$ in. wide or diameter is Rockwell C 62. In general, the harder cutters have been found to give a much longer life between grinds. Frequently, cutters softer than the limits specified are accepted where usable, in order to keep production moving, even though they will not stand up as well. One milling cutter used on Bren barrels, having a hardness of Rockwell C 64–65 has been found to average 76 pieces between grinds, while a softer cut-

ter for the same operation averages only 40 pieces between grinds.

Next, the cutters are checked against the drawing for dimensions and for general workmanship. Here, inaccuracies as to form are taken up with the senior inspector of the production group that will use the cutter, if variation from the print is very small. The senior inspector accepts or rejects the cutter on the basis of whether the variations are within manufacturing tolerances. Other dimensional variations and poor workmanship are taken up with the tool supervisor, who accepts or rejects the cutter in question. Cutters are returned from the standards room to stores designated as rejected, accepted outright, or accepted subject to correction.

On broaches and other form tools that are difficult to check, the inspection standards room inspector makes up a tool proving report and sends this report together with the cutters to the assistant chief inspector in charge in the department where the tools are to be used. These tools then are turned over to the supervisor of the department for actual trial. If the parts machined with these cutters pass inspection gages, and have satisfactory finish, the cutters with the approved report are returned to standards for delivery to stores.

Cutters are not rejected unless absolutely useless for the operation; the company makes every effort to cooprate with cutter manufacturers in the interest of keeping production going. In every case borderline problems are settled on the basis of required tolerances on the finished pieces and the desirability of using cutters that can be made to work in any possible way.

Accepted cutters go directly into stores stock, while those accepted subject to correction are tagged and segregated until instructions are issued by means of an order from the purchasing department for reworking. Rejected cutters are returned to the supplier by the storekeeper on receipt of shipping instructions issued by the purchasing department. Before any cutters go into stores stock, they pass to an etching station for application of government markings and cutter serial numbers. Cutters also are marked with the degree of rake on the cutting edges, so that the same rake angles can be maintained when regrinding the cutters. Upon delivery of accepted cutters to the main stockroom, a record is made in a card file and the cutters are placed in the proper bins, with their cutting edges protected by wrapping gummed paper or by placing the cutters in cardboard containers.

Sub-stockrooms for cutters and certain other tools are conveniently located throughout the shop to serve one or more production groups. Issues to these sub-stockrooms are made from the reserve tool stores, up to the limit of the "working supply" predetermined by the tool supervisor, without any transfer document. However, the transfer is recorded both in the main tool storeroom and in the sub-stockroom. The working supply of each cutter in the shop is based on requirements for three days, with so many cutters at the machines, so many in sub-stores and so many in the cutter grinding room. The reserve stock for each cutter is based on normal requirements in relation to normal delivery time. Every effort is made to keep enough cutters in reserve stores to cover requirements, and orders are placed automatically by the storekeeper to keep a minimum supply in stock at all times so as to insure continuity of production.

How Cutters Are Salvaged

Broken and undersized cutters that are not useable on production are returned to the sub-storeroom, with a "repair and replacement" requisition signed by the department foreman. These then are returned to the inspection "standards" room by a tool chaser for an inspection prior to delivery to the storekeeper. The storekeeper delivers these cutters to the cutter salvage department, and this return of cutters to the storekeeper authorizes delivery of replacement cutters from reserve stores, so as to keep the working supply in the shop at a predetermined minimum. Once the number of cutters set up as a working supply has been delivered to the sub-stockroom, no additional cutters of the same size can be requisitioned from the reserve stores unless the tool supervisor approves an increase in the working supply. Such increases are based on increases in production requirements, and are requested on a special form.

When work was started on the Bren gun, operations were put into production as rapidly as the tools could be made and "proved." Cutter requirements for these operations were predetermined on the basis of estimates made by tool design and production supervisors. These estimates now are being revised according to actual records of cutter life (production between grinds). However, when the Browning and Boys tools were tried out, the assistant tool supervisor estimated cutter life on the basis of past experience on Bren parts and trial cuts with the new tools. Thus, the working supply of cutters for these new guns has been estimated on a more satisfactory basis and fewer requests for changes in the working supply are necessary.

In order to show the need for careful application of tools, every machining operation on a part involving more than 130 machining operations was studied and speeds and feeds were adjusted up or down, cutter arbor runout was corrected, fixtures were checked, etc., to improve the operation as much as possible. Then the approximate number of pieces per grind was

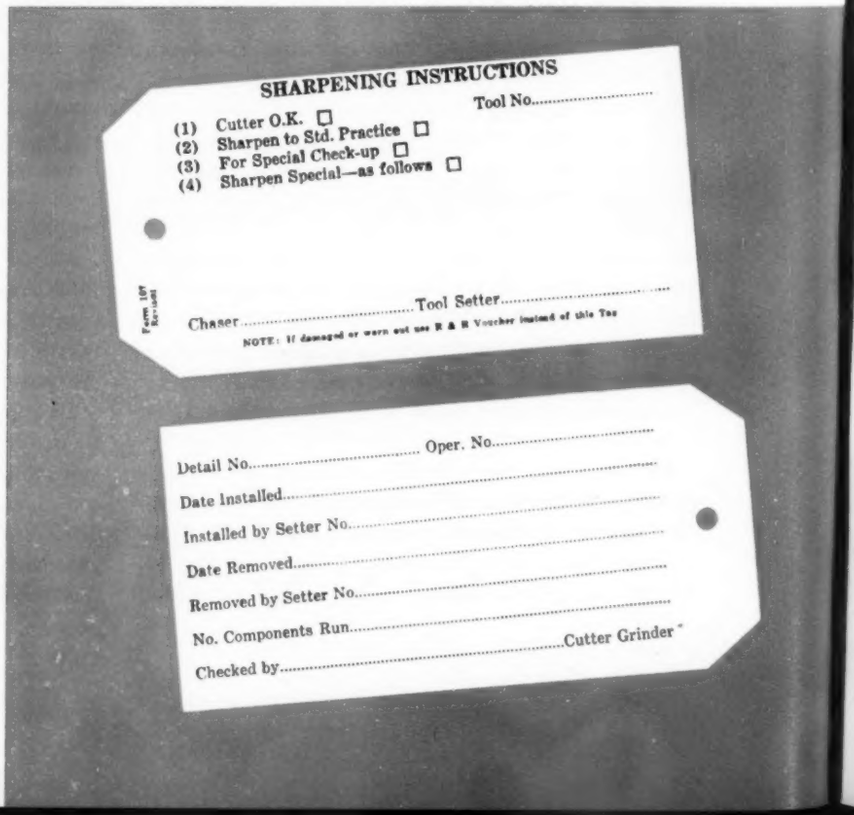
determined on the basis of the new conditions and a working supply set accordingly. In some cases a change from conventional to climb milling, in other cases a reduction of milling speed with a considerable increase of feed, increased production per cutter grind three or four times. The results of this survey spread through the shop by word of mouth from supervisor to supervisor, and this has resulted in a market improvement in many other operations.

When the working supply of cutters for an operation is found to be too low, because of the installation of additional machines, or increased production requirements, a working supply change request form is made out by the shop foreman and approved by his superintendent, then this request is checked by the tool supervisor to determine whether the increase is justified or whether some change in the tool or fixture in the set-up can be initiated to make this increase of working supply unnecessary. If the increase is justified, the form is approved and sent to the storekeeper who delivers to the sub-stockrooms the necessary additional cutters. This delivery automatically adjusts the reserve stock quantity and the storekeeper initiates a purchase requisition to bring the reserve stock up to the required minimum.

A cutter grinding department is located in each of the three main shop divisions. Dull cutters are delivered to these departments by the sub-stockrooms with tags attached to indicate the work to be done

The initial issue of tools for a given operation is made from the sub-stockroom on a tool transfer requisition signed by a tool chaser. When a dull cutter is returned to the stockroom and is replaced from stock, the transaction is made by simple exchange without any change of records. However, if the cutter is damaged so as to be unusable, or is undersized, a repair and replacement voucher is made out and sent with the cutter to the main tool storeroom, so that it can be replaced. If it is not possible to secure a new cutter from reserve stores a notation is made on the sub-stores record card and the stock figure is reduced pending completion of the transaction.

Each division has its own cutter grinding department and dull cutters are forwarded by the sub-stockroom to the cutter grinding room, the quantity and type of cutters so transferred being recorded on a card as an "out" and "in" record covering the move-


SHARPENING INSTRUCTIONS
Tool No.....
(1) Cutter O.K. ☐
(2) Sharpen to Std. Practice ☐
(3) For Special Check-up ☐
(4) Sharpen Special—as follows ☐
Chaser.....Tool Setter.....
NOTE: If damaged or worn out use R & R Voucher instead of this Tag
Detail No.....Oper. No.....
Date Installed.....
Installed by Setter No.....
Date Removed.....
Removed by Setter No.....
No. Components Run.....
Checked by.....Cutter Grinder

Attached to each cutter returned by the shop for sharpening is a tag showing the work to be done. On the reverse side of the tag is shown a record of the job for which the cutter was used

Special racks are employed in each tool crib in order to prevent damage to sharp cutting edges. Cardboard spacers separate adjacent cutters; in many cases cutting edges also are protected with gummed paper

ment of cutters between the stockroom and the grinding department. Stockroom chasers act as follow-up men after the urgency of return has been made known by pressure from shop tool chasers. In general, it has been found that it is not feasible to set up a definite regrinding schedule according to pieces produced by each cutter. Now, the production record is used to set up a checking point and each cutter is reground as soon as it shows signs of becoming dull. The decision as to when the cutter is dull is based on the combined opinions of the machine operator, the shop set-up man, the production inspector and the shop foreman. When the cutter has been found dull, it is removed from the machine and taken to the sub-storeroom by a tool chaser. This chaser attaches to each dull or damaged cutter a tag showing the work to be done. This tag is initialed by the set-up man and the tool chaser.

A card record for each cutter is kept in the sub-stockroom. This card shows the tool number and the location of the cutter in the bins, as well as the working supply. Movements are listed in four columns: (1) tool transfer number, (2) quantity, (3) machine number, and (4) return. An additional four columns are headed: (1) received—showing receipts from reserve stock, (2) issued, (3) quantity, (4) active—which is the balance in the sub-stockroom or in the grinding department.

Cutters to be reground are received from the sub-stockrooms, each cutter carrying a tag giving sharpening instructions. Cutter grinding work is allocated to the different machines by the grinding department foreman, who is guided by priority instructions issued daily by the sub-stockroom. A cutter inspector, working on the staff of the tool supervisor, inspects all work done and, if it passes, the cutter is returned to the sub-stockroom. If rejected, the cutter is returned for correction. The inspector makes a daily report to the tool supervisor showing the total cutters accepted and rejected. Now, about 7,000 cutters per week are being sharpened on three shifts in the three grinding rooms.

Cutters for re-work may be in one of four classifications: (1) requisitions from the purchasing department to cover corrections of faulty work by outside suppliers, or the toolroom in the manufacture of new cutters, (2) requisitions from the tool design depart-

ment to cover changes in cutter design, (3) requisitions issued by the storekeeper to convert old cutters from the salvage department, and (4) repair and replacement vouchers to cover substantial repairs to cutters.

Only a small percentage of the cutters required for production operations are made in the toolroom, the greater portion being purchased from regular cutter manufacturers. Those ordered from the toolroom are to relieve bottleneck conditions where quoted deliveries are too long, or where special conditions must be met quickly. Requisitions are made out by the tool design department or the storekeeper and must be signed by the production superintendent in order to insure holding this activity to a minimum. Such requisitions are passed through the purchasing department and the inspection "Standards" room as in the case of cutters purchased from outside suppliers.

All broken, undersize or obsolete cutters are delivered to the cutter salvage department with repair and replacement requisitions. Once each day these requisitions are examined and a decision is reached as to the proper classification of the cutters. If scrapped, the cutter is placed by the government inspector in a locked box and he signs the requisition. If undersize or obsolete, the cutter is placed in salvage stock and the requisition is signed by the government inspector to acknowledge this disposition. As soon as practical thereafter, the tool salvage inspector etches "undersize" on the cutter. It is agreed between the government inspector and the tool salvage inspector that the latter will not issue a cutter without it having been marked undersize or the old number being obliterated.

Foremen, tool chasers, or set-up men contact the salvage department inspector when special cutters are required. In some cases an undersized cutter is put back on its original operation, the cutter being issued against a stores credit voucher. In other cases the cutter can be made serviceable by reworking, or in some cases by a change of tool number, and in such cases the salvage department inspector makes out a purchase requisition specifying the old cutter number, reworking instructions, the new cutter number, the part and operation number for which it is to be used. This purchase requisition is sent to the stores department, after approval by the tool supervisor, and a requisition on the cutter grinding department is made out for the necessary rework. In a few cases, cutters may be loaned to the shop for a try-out on an operation. A card record is kept to show the quantity and disposition of cutters in the tool salvage department. Such tools loaned to the shop from the tool salvage department are kept at a minimum, so that the inspector in charge may be able to keep an accurate record of their disposition. Where such cutters are placed in a shop department for an extended time, a stores credit voucher is issued.

After sharpening, each cutter is inspected carefully before return to sub-stores stock. Standard bench lathes are used for many inspection operations on cutters, in place of bench centers, because of the ease with which set-ups can be made

Inserted-Tooth Circular Metal Saws

Courtesy Henry Disston & Sons, Inc.

How to obtain greater efficiency and make teeth last longer.

FAILURE	CAUSE	CORRECTION
Tooth breakage	Improper sharpening.	Follow manufacturer's instructions.
	Teeth dull.	Sharpen saws before dull teeth cause dragging in cut.
	Stock slipping.	Always be sure stock is rigidly clamped.
	Feed too fast.	See recommendations.
	Chatter.	Remove back-lash in gears or worm drive. Tug pins or key should fit snugly in saw pin holes or keyway.
	Improper tooth spacing.	Tooth spacing is right when two or more teeth are in cut at all times.
Premature wear	Speed too fast.	For ferrous metals should not exceed 60 ft, per min. rim speed. Non-ferrous metals from 400 to 1,000 ft. per min.
	Insufficient or improper coolant.	Insure full flow of proper coolant. A good grade of soluble oil is recommended
	Irregular feed.	Check machine and overhaul where necessary.
Cutting out of line	Improper grinding.	When sharpening, be sure that face and tops of teeth are ground square with blade, and that saw is round.
	Machine misalignment.	Be sure saw travels at right angles to work clamps.

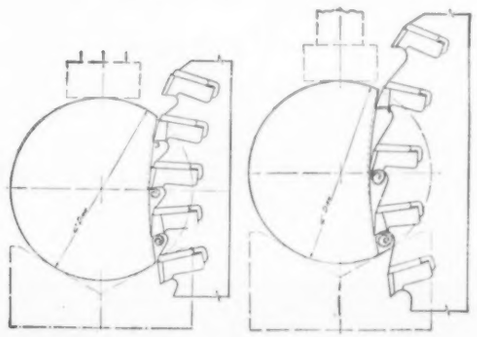
RECOMMENDATIONS

	MATERIAL	RIM SPEED Ft. Per Min.	FEED Sq. In. Per Min.
Feed and Speeds	STEEL	40	2½ to 10
	CAST IRON	40	5
	BRASS	500	80
	COOPER	750	60
	ALUMINUM	1200	90

In general, the feed depends a great deal on the hardness of the stock to be cut, which means that the harder the stock to be cut the slower the feed.

This material appears on the control cards used in the Disston tool conservation plan.

Diagrams indicating gullet capacity for chips of various metals

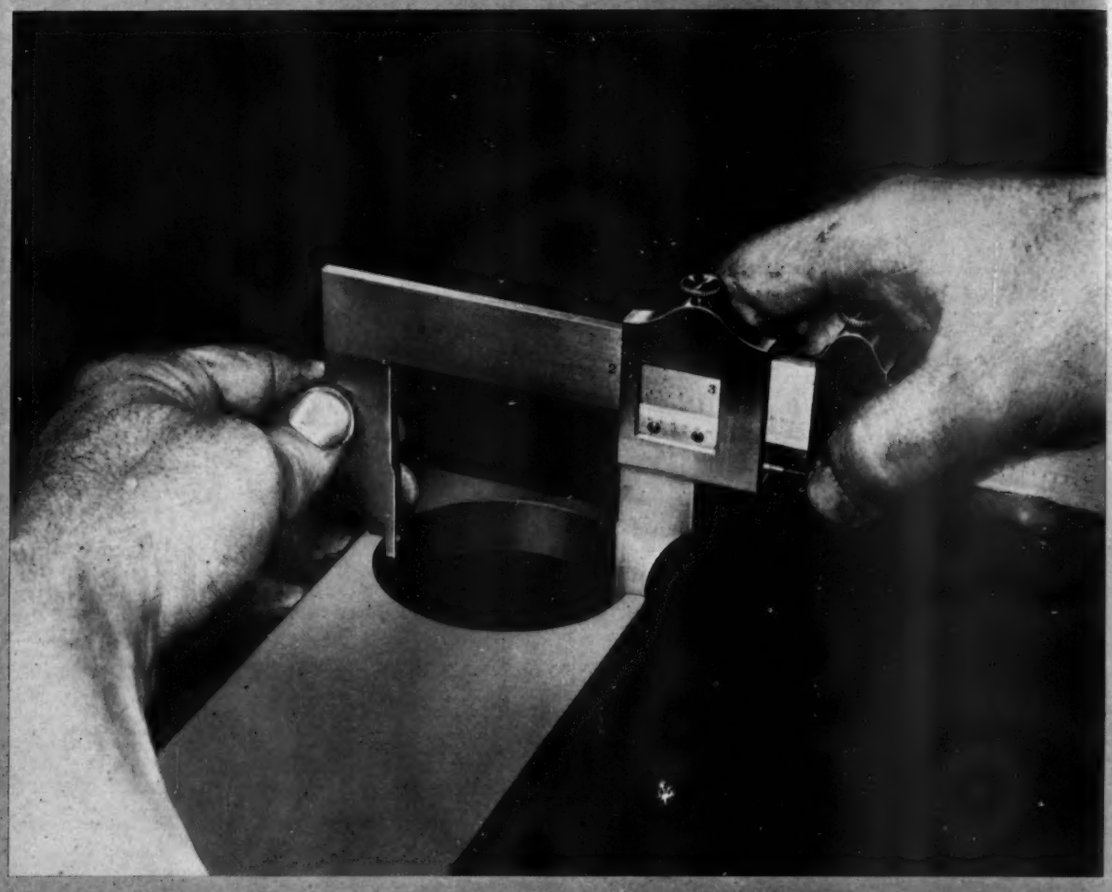


Showing short chips of high carbon and alloy steels

Showing long, stringy chips of brass and low carbon steel

STARRETT TOOLS

The Measure of SUPERIORITY



VICTORY will be assured once America's fighting forces are supplied with more and better equipment. In striving for increased production, remember that volume is worthless without accuracy. Starrett Tools speed work along through production and inspection with sure, unfailing accuracy. They inspire extra confidence that results in greater efficiency, better, faster work. Write for Starrett Catalog No. 26 C.

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PRECISION TOOLS • DIAL INDICATORS • GROUND FLAT STOCK
HACKSAWS • METAL CUTTING BANDSAWS • STEEL TAPES

AMERICAN MACHINIST REFERENCE BOOK SHEET

Circular Saws for Cutting Metal

Courtesy Henry Disston & Sons, Inc.

FAST RUNNING METAL SAWS

CIRCULAR—MEDIUM AND MILD TEMPER

How to obtain greater efficiency and make saws last longer.

FAILURE	CAUSE	CORRECTION
Premature wear	Operating speed too high.	See recommendations for material below.
	Use on abrasive materials.	Do not use saw on materials which should be cut with abrasive wheels.
Tooth breakage	Irregular feed.	Avoid hand feeding. Use mechanical or hydraulic feed wherever possible.
	Incorrect tooth spacing.	Select proper tooth spacing or refer to manufacturer for recommendations.
Blade breakage	Hanging up in the cut due to irregular feed.	If by hand, feed uniformly. If mechanical or hydraulic, make repairs
	Twisting stock when feeding.	Be sure stock fed by hand is kept in alignment.
	Feeding too fast.	Avoid excessive feeding.
	Insufficient clearance.	Use saw with sufficient side clearance to prevent binding.

RECOMMENDATIONS

Material to be cut	Saw Arbor Above Work		Saw Arbor Below Work		Rim Speed in Feet Per Min.	Feed in Inches Per Min.
	Style Tooth	Hook Angle	Style Tooth	Hook Angle		
BRONZE	2	Rad.	2	10°	750 to 3000	20–30
	3	Rad.	3	10°		20–30
BRASS	1	Rad.	1	15°	1000 to 6000	50–60
	3	Rad.	3	15°		50–60
COPPER	1	5°	1	20°	750 to 6000	60–70
	2	5°	2	20°		60–70
ALUMINUM	1	10°	1	25°	800–1000	70–90
ZINC	1	5°	1	20°	800	70–90

STYLE 1

Regular Straight Metal Saw Tooth

STYLE 2

Alterate Square and Beveled Metal Saw Tooth

STYLE 3

Regular Topped Metal Saw Tooth

MILLING SAWS

CIRCULAR—HIGH TEMPER

How to obtain greater efficiency and make saws last longer.

FAILURE	CAUSE	CORRECTION
Premature wear	Operating speed too high for material.	Do not exceed 60 ft. per minute for ferrous materials. See recommendations below.
	Feed too light.	Increase feed until chip is normal. See recommendations below.
Tooth breakage	Stock slipping or turning.	Inspect clamping, device. Use V block to hold rounds.
	Saw slipping on arbor.	Always use key or tug pins. Do not depend upon collars for clamping.
	Saw chatter.	Overhaul gearing to remove backlash.
Blade breakage	Stock slipping or turning.	Clamp stock rigidly.
	Saw slipping on arbor.	Drive with key or tug pins.
	Hanging up in cut due to irregular feed.	Inspect feed mechanism. Overhaul or re-new worn parts.

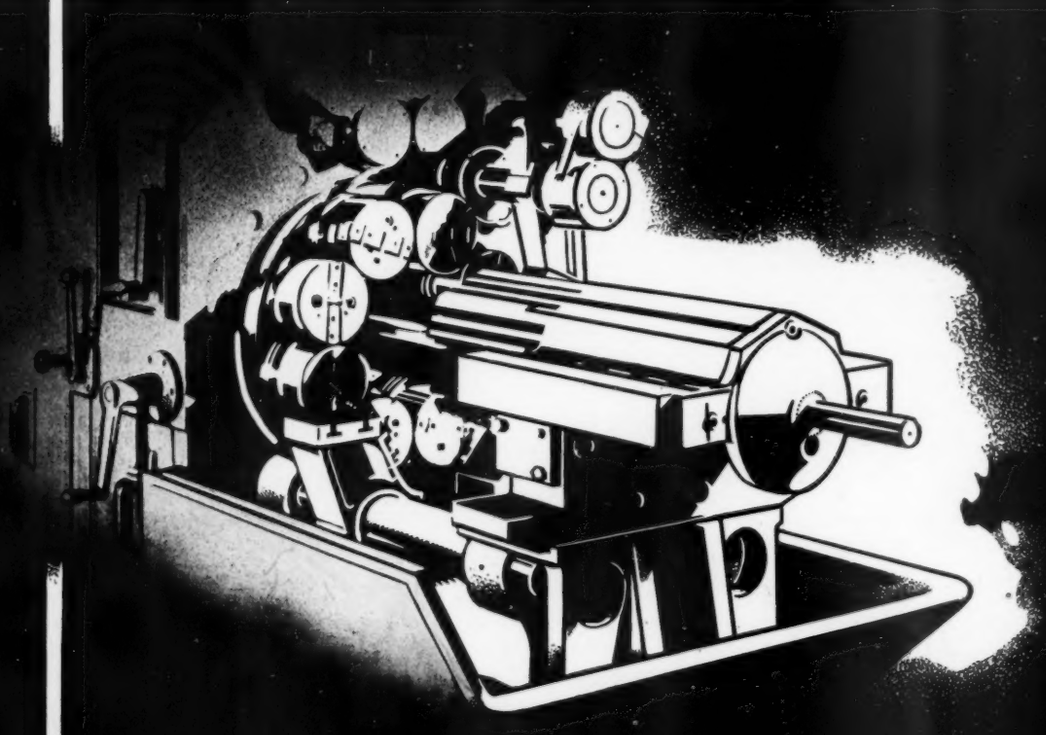
RECOMMENDATIONS

Material to be cut	Saw Arbor Above Work		Saw Arbor Below Work		Rim Speed in Feet Per Min.	Feed in Inches Per Min.
	Style Tooth	Hook Angle	Style Tooth	Hook Angle		
STEEL (Tool & Alloy)	3	Rad.	3	5°	40–60	$\frac{1}{32}$–$2\frac{1}{2}$
(Tool & Alloy)	2	Rad.	2	5°	40–60	$\frac{1}{32}$–$2\frac{1}{2}$
STEEL (Low Carbon)	3	Rad.	3	5°	40–60	2–$3\frac{1}{2}$
(Low Carbon)	2	Rad.	2	10°	40–60	2–$3\frac{1}{2}$
CAST IRON	3	Rad.	3	Rad.	50–70	3–5
BRONZE	3	Rad.	3	10°	150–250	10–15
BRASS	3	Rad.	3	15°	300–700	12–20
COPPER	1	5°	1	20°	500–700	10–20
COPPER	3	5°	3	20°	500–700	10–20
ALUMINUM	1	10°	1	25°	800–1000	40–80
MONEL	3	Rad.	3	5°	100–200	2–$3\frac{1}{2}$

This material appears on the control cards used in the Disston tool conservation plan.

THIS is the "business end" of a New Britain Chucker . . . Wide open from all sides and top for tool accessibility and ease of chip removal.

Such basic advantages have made NEW BRITAIN a name which stands for outstanding value and performance in Automatics. Today our output (on a twenty-four hour basis) is entirely at the service of the nation's war industry.



NEW BRITAIN AUTOMATICS

A complete line of chuckers — Four, Six and Eight Spindles to 10¼" Capacity.
Also a complete line of Multiple Spindle Screw Machines up to 2¼" Capacity.

NEW BRITAIN-GRIDLEY • MACHINE DIVISION
THE NEW BRITAIN MACHINE CO. • New Britain, Conn.

Prime Contractors Must Be Fair

COOPERATION of three parties—the prime contractor, the subcontractor and the government—is necessary if every machine and every shop is to be put on war production.

The government is straining to bring prime contractors and subcontractors together. It is doing a reasonably good job.

The subcontractor has at least partial control over his own fate. He can sit in a rocking chair and probably wait in vain for Uncle Sam's agent to come knocking on his door with an order. On the other hand, he can "get a hump on" and scour the countryside, with government assistance, for war work which will fit his facilities.

Entire control, however, is not in his own hands. That is where the third party—the prime contractor —comes in. For the prime contractor's cooperation is essential.

What are we driving at? Listen to a New England correspondent's complaint.

He says that a number of small shops up there won't be able to get anywhere until prime contractors change their attitude. The only parts that the prime contractors are willing to subcontract are parts that they themselves cannot make at a profit. These parts are of intricate design, require close dimensions and in many cases must be made on special machines which only the prime contractor possesses.

Our correspondent concludes, "Until there is a change of attitude, with the subcontractor taking on work which he can do on his regular machines without loss, and with the prime contractor reserving for himself the jobs requiring the extreme accuracy that can be secured only with his own special machines, *the smaller manufacturer will not be able to contribute to national defense, no matter how much he is willing and anxious to do.*"

In justice to thousands of prime contractors who have done the right thing, it should be said that they have farmed out sizable percentages of their total business, though their costs were upped two or three times what they would have been had they done the work themselves.

Nevertheless the case cited is not an isolated one. We have run across others elsewhere. In a number of instances the prime contractor has tried to pass along to subcontractors the dirty jobs that he himself did not want.

Prime contractors must be fair and reasonable in their dealings with prospective subcontractors. Obviously the smaller plants haven't the organization, the equipment and the special skills of the bigger plants. But with a little help they will do a creditable job.

Many prime contractors have been operating under low-bidder contracts which permitted no leeway for high-cost subcontracting. Perhaps that cause of trouble will disappear, now that Mr. Nelson has decreed that all war contracts are to be on a negotiated basis.

Britain found it profitable to allow prime contractors something extra when subcontracting boosted costs. By doing the same thing, we will speed up the spread of war work through all of America's machine shops.

Burnham Finney

GAGING BUSINESS

Machine tool advisory committee formed. Output of machine tools may reach $1,600,000,000 in 1942. Many war contractors are able to retool large percentage of existing machines

A machine tool industry advisory committee has been organized to act as a liaison agency between the machine tool section of the War Production Board and the machine tool industry. It is composed of 13 men. As its name indicates, it will act strictly in an advisory capacity and should not be confused with the more powerful industry branches of WPB, of which there are now 24. The industry branches have widespread authority over specific industries through their chairmen. As yet no industry branch is contemplated for the machine tool industry.

Machine Tools—With war production requirements indicating urgent need for more machine tools of the critical types, the machine tool industry is using every possible device to enlarge its output and to increase its manufacturing capacity. Now it appears that the total volume for 1942 may go as high as $1,600,000,000, or about $300,000,000 more than earlier appeared attainable. It is firmly believed that before the year ends the industry will be operating on a basis of $2,000,000,000 a year, or approximately 20 times the volume in an average prewar year.

Some companies are building new plant additions, though they already have expanded two or three times since the war started. Others are acquiring factories in their local communities which can be put to work quickly making machine tools. Competent subcontractors are at a premium. In certain cases they have had their orders from machine tool builders doubled and tripled, particularly where the production of complete machines is involved.

To stimulate the greatest possible effort, the WPB has talked with every machine tool builder since the first of the year, placing before him the broad outline and many of the details of what is expected of him. Pool orders, whereby builders produce machine tools for the government for war plants to be selected later, have increased greatly in size. They probably amount to $700,000,000 at present. Washington is trying to maintain a proper balance between expansion of machine tool plants (which would take a considerable number of new machine tools) and using the same machine tools for immediate war production.

Under the pressure of converting metal-working shops quickly to war work, many war contractors are finding that they can retool a much larger percentage of existing machine tools than they heretofore had thought possible. If new tools are not at hand, jobs are improvised on older tools. This has been found true especially in the automobile industry where retooling is being accomplished much faster than originally estimated.

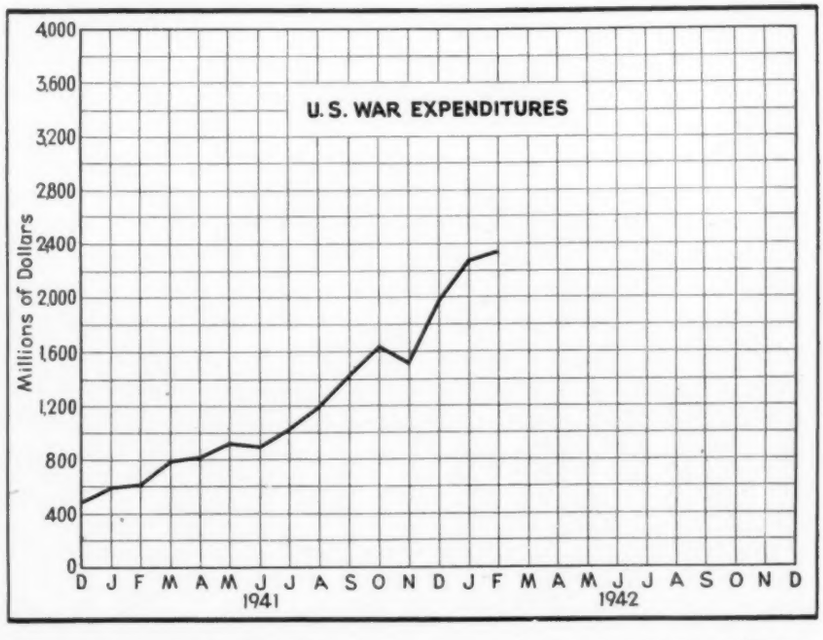
Tanks—President Roosevelt's goal of 45,000 tanks in 1942 seems to be within reach. Last fortnight a new midwestern plant began mass production of the M-4 medium tank. Delivery schedules for other arsenals under construction have been pushed ahead considerably. Companies producing the out-moded M-3 are switching to the M-4 with little loss in production rate. One automobile company is about to deliver heavy 60-ton tanks, following several months of preparatory work. Other auto makers are working on heavies as well as on lighter types.

Steel—Alloy steels are among the shortest of the short materials. Some plants have had to stop production on A-1-a war orders pending receipt of certain alloy steels. In some cases the Army and Navy have insisted on alloys, for which production capacity has never been high, when more plentiful materials could have been used successfully. The Maritime Commission has eased the steel plate situation by lumping all plate needed for 770 Liberty ships, and letting contracts for a single width to each strip mill. Thus each plant can operate continuously on one-width plate without frequent stops and delay to switch to other widths.

Aircraft—Donald Nelson may place all aircraft companies under a single head, similar to Czar Kanzler's position at the head of the auto industry. A prominent automotive production man is mention for the post. Plane makers will protest this appointment, but an automotive man it will be if the War Production Board chief thinks he will do the best job.

Munitions—Bomb and shell production is being accelerated. Many firms that made excellent records on other war contracts have been asked to bid on shell manufacture. One of the bottlenecks in bomb output have been fuse mechanisms. Only a few firms are now working on them, and these only after months of trial. But more firms are being brought into the picture. Some 40 companies are bidding on fuze parts for a bomb standardized for the Army, Navy and British.

Copper—Sometime ago the copper supply seemed adequate for all war needs. Increased requirements, however, now top supply by an uncomfortable margin. This may have been one of the reasons for the Army's recent announcement that shell casings would be made from steel rather than brass (most copper goes into brass for shell cases). But it will be sometime before steel cases can be made in sufficient quantities to have much effect on copper requirements.



February Record—Expenditures for war reached a new high of $2,330,000,000 in February, the short month. This is an increase of 4.5 percent over January. Payments per working day averaged nearly $100,000,000

CHLORINATED SOLVENTS SHORT

WASHINGTON—All fabricators of metals take warning from the Chemicals Branch of the War Production Board and look into every possible cleaning method other than chlorinated solvents, which are already beginning to run short. The shortage is caused by increased metal working. Manufacturers with war contracts are included in the warning.

Chemicals Branch says that at least 30 percent of the cleaning operations in metal working now being done with chlorinated solvents can be accomplished with other materials. Mineral spirits, non - chlorinated - solvent - water emulsions and alkalis are suggested. The shift to a new method should be made now to avoid serious delays later on.

Psychology Boosts Output Of British War Materiel

LONDON—Output of shell fuse cases in a British munitions factory was increased twenty-fold after adoption of suggestion improving methods of working, which were made by industrial psychologists (Industrial psychology is the British equivalent of time and motion studies in the United States.) The job required careful hand-soldering of seams.

When the factory lost most of its experienced solderers, the weekly output dropped to only 1,000 good cases with many rejects. Systematic training schemes, based on careful study of hand and body movements, raised output to 20,000 cases weekly. Few cases were spoiled. Application of industrial psychology, time and motion study, has also been instrumental in speeding up production of many other British war industries including companies turning out tanks.

Will Force More Manufacturers Under PRP To Increase, Improve Allocation of Material

WASHINGTON—The order P-18-a granting a priority rating of A-1-a to material orders placed by manufacturers of cutting tools has been extended to July 1. Thereafter, however, manufacturers are warned that they will be expected to operate under the Production Requirements plan. After May 1, makers of welders, who have been operating under P-39, will have to use PRP. These are only two of several recent moves to force manufacturers onto PRP. When the conveyor machinery order, P-78, expired a few weeks ago, manufacturers were told to use PRP instead. Similarly, the mining machinery, elevator, and farm machinery orders have been amended to incorporate the procedures of the Production Requirements Plan.

PRP, familiarly known as "Purp," is the coming thing in priorities, and firms which are not now using it should get acquainted with it. It's being pushed because it offers the most promising possibility yet of achieving the thorough-going system of allocation at the manufacturing end which Donald Nelson has been promising since last fall

Allocations Definite

Allocation can be a good many things. On the raw materials level, where it is already commonplace, it means that a producer is told monthly just where to deliver his product. But at the final manufacturing end it is something else again. Under a full system of allocation each manufacturer would be told that in the month of April he will be allowed so many pounds of this material, so many tons of that. There would be only two priority ratings—yes and no.

A conventional priority rating, on the other hand, is simply a ticket to stand in line at the window where the goods are sold. A high rating puts its holder up near the head of the line. But no one can tell, until he gets to the window, whether it will still be open.

To get in under the Production Requirements Plan, a manufacturer fills out a rather terrifying looking three-page form, PD-25A. This calls for complete data on the products manufactured, the priority ratings on and destination of goods shipped, and a detailed breakdown of the physical quantities of materials used in the third quarter of 1941 and estimated needs during the coming quarter. A somewhat simpler form, PD-25X, may be used by firms doing an annual gross business of less than $100,000.

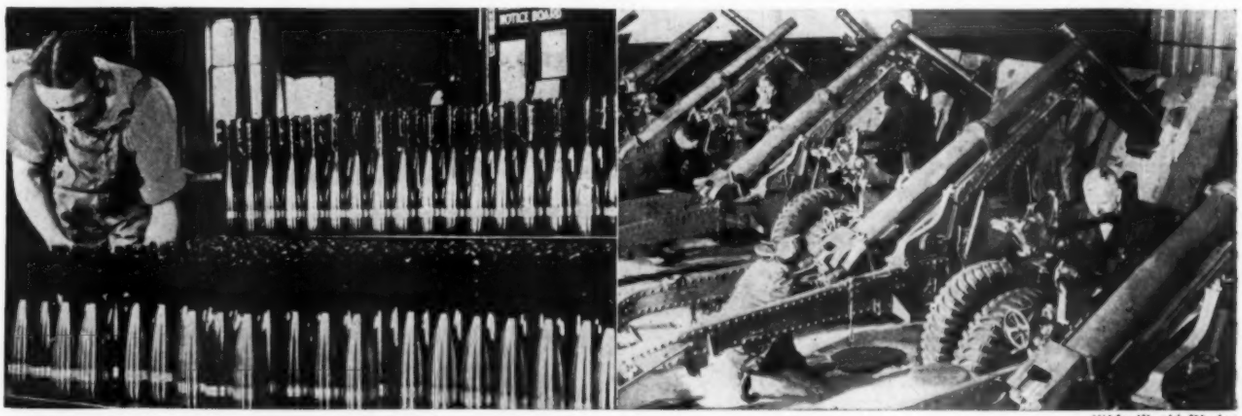
Assigns Specified Quantities

Processing of either application in Washington normally takes ten days to two weeks. What the manufacturer gets back is a copy of his application endorsed to provide him with a priority rating or several different ratings on specific quantities of the materials he has asked for. The rating is good for a quarter-year. If, during the quarter, the pattern of his needs change, or if he finds the rating won't get him the stuff, he may file a supplemented application, PD-25F.

This feature of tying a priority rating to a specific quantity of goods is new to the priority system. And it is an essential element in the allocation-like features of the plan. Originally it was intended more or less as a ceiling on the use of the rating—to prevent abuse of a priority which it was intended to hand out rather liberally.

More Information Needed

Gradually, however, the view has grown up that it's pretty silly to give a man an A-8 rating, say, on 100 lb. of tungsten steel if an A-8 just won't get him any tungsten steel. Thus, rather than merely use a mathematical sys-



Wide World Photos

Getting Ready—Australia is rushing production of war equipment to meet the advancing threat of the Japanese. Worker at left inspects trench mortar bombs. Completed 25-pound howitzers are being checked at right, preparatory to being routed to the defense outposts of the down-under continent. All parts of these guns are interchangeable and the intricate breech block can be assembled from parts selected at random

tem to convert the ratings on a man's orders into a rating granted him for materials, the tendency is either to refuse a rating or to give a high enough rating to get the goods, even though for a smaller quantity than was applied for.

Clearly, if WPB had enough information about industry—the sort of information contained in the PD-25-A application form—it could do this with certainty. But at present, there can be no assurance that there will really be enough material to fill all the rated orders. This is particularly the case because other types of rating, such as the conventional P order, set no limit on the amount that may be brought under the rating.

This is why more and more such ratings are being brought into the framework of the PRP. You can expect the process to continue.

Cost, Design, Fuel Problems Stymie Sea Otter Program

WASHINGTON—The Navy's proposed 1,900-ton cargo ship, Sea Otter, to be propelled by a battery of automobile engines, has run into design difficulties and there is no prospect of early production. Development work is continuing, however.

At a recent press conference, Navy Secretary Frank Knox outlined three problems blocking progress: (1) Cost of the ships has been estimated upward about 25 percent; (2) the vertical propeller shaft—which runs down through the bottom of the hull—had to be lowered 7½ ft., which created technical problems; and (3) the Navy has decided that gasoline engines would be too dangerous, and provisions must be made for burning Diesel fuel.

FDR Offers Suggestion

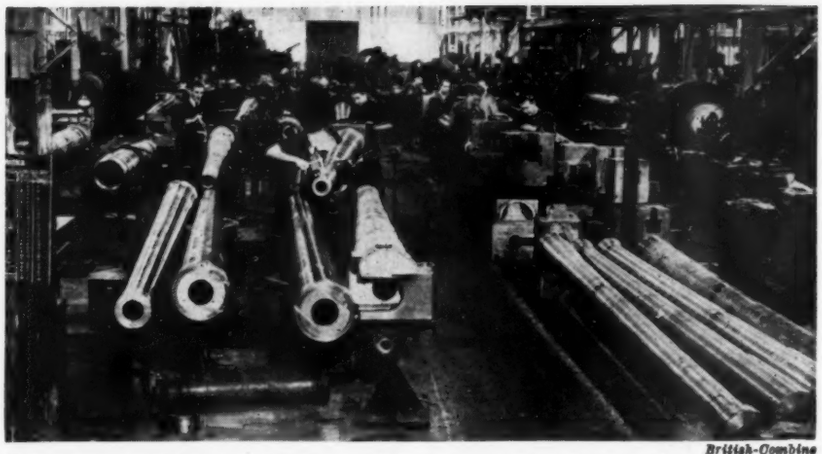
The original plan was to use the Sea Otter for odd jobs, especially for getting into shallow harbors where other ships can't go. Letting the propeller down not only created mechanical problems, but it also increased the draft thereby partly canceling the objective.

At his press conference last week, the President said the propellers might be put at the stern on horizontal shafts in the conventional manner, and be powered with Diesel engines.

The vertical shaft and propeller was said to be much like an outboard motor system. Presumably the object was to save the forging of a long drive shaft. First plans called for 16 110 h.p. automobile engines.

FILM TRAINS PRINT READERS

MINNEAPOLIS—A two-reel sound film for training machine shop apprentices in blueprint reading has been completed by Film Productions Co. Animated drawings and special photographic effects show fundamentals that are otherwise difficult to explain.



British-Combine

Guns by the Thousand—Guns of the two-pounder class and over are rolling out of British factories at the rate of 30,000 per year, and by year end the rate is scheduled to be 40,000. Barrels are being checked in foreground, above, while machine operations are performed in background

Harrison Thinks Production Goals Too High, Challenged by Nelson Who Wants More Ships

WASHINGTON — First high official openly to challenge the feasibility of President Roosevelt's huge plane-tank-ship-gun program was William H. Harrison, War Production Board director of production.

Mr. Harrison said he did not believe the quota of 8,000,000 tons of merchant ships could be built this year.

Donald Nelson, WPB chairman, came back at Harrison with the opinion that the ship qota should be increased rather than reduced. "The whole nation is at stake," he said.

Apparently Mr. Nelson took action, for AMERICAN MACHINIST learned that within a few days the Maritime Commission would announce a merchant ship program of 20,000,000 tons in 1942-43 instead of the President's 18,000,000, which was divided 8,000,000 tons in 1942 and 10,000,000 in 1943. Apparently the additional two million tons is to be tagged onto the 1943 program, but the Commission hopes to raise the 1942 bogey above the original eight million.

Nelson, Commission Displeased

Observers say that Mr. Nelson is displeased with Mr. Harrison for letting his sights down, and the Maritime Commission obviously doesn't like it. It is no secret in Washington, or elsewhere, that many persons competent to know, feel that we will fall short of the President's program in some categories. But few doubters, except Harrison, were willing to say so publicly. They felt that industry should aim confidently at the mark set for it.

Some persons admire Harrison for his realistic attitude and his forthrightness. But he has been in disagreement at WPB on other than shipping matters—some say on machine tool matters —and it seems likely that he will move to some other job.

Liberty Items Bulked

Meanwhile, as yards deliver a ship a day (although Mr. Harrison said they were several ships behind schedule) C. E. Adams, chief of the Iron and Steel Branch of WPB, announced that much of the steel plate for merchant ships from now on will come from mills which last year were turning out sheet steel for automobile bodies.

To speed the building of Liberty ships, which are on a subcontract-and-assembly basis, items of similar size are grouped together in a new bill of materials. Specific items will be obtained from strip mills with facilities suitable for the production of the sizes involved. Any given mill will deliver plates of a certain size to a number of yards.

Applies Line Methods

High speed strip mills were built to take care of large orders of one size, auto body steel being the main one. The new plan applies assembly line methods to ships.

Heretofore about 10 percent of the Liberty (EC-2) steel came from strip mills; under the new setup, 80 or 90 percent will be strip mill plate.

This is the largest item of steel plates in the entire war program, covering 770 new ships for which no materials have as yet been ordered or scheduled.

Tonnage for Liberty ships represents more than half of the Commission's entire requirement of plates. This strip mill program is expected to ease a part of the burden on sheared plate mills, which face requirements greater than they can produce. But the plan will not free any steel plate for civilian use.

COMPANY USES ALL FACILITIES ON WAR WORK

Other firms should follow similar course to get on Victory Program. Plant study, analysis key to securing munitions contracts

BY A. W. JESSUP

A SMALL EASTERN TOWN—You can find war work for which your plant is suited. But you have to go after it! It won't come to you. First, a thorough analysis must be made of plant equipment and personnel and the type of work they can perform. Second, go to the nearest regional office of the Contract Distribution Branch of the Division of Industry Operations, War Production Board, where aid will be given in picking from the long list of war products those whose manufacture most nearly follows your peacetime production.

The CDB will also give aid in contacting prime contractors for subcontracts and in going directly to the procurement agencies (Army, Navy, Maritime Commission or Treasury department) for prime contracts.

Little Change in Operation

By following this course, an eastern manufacturer of paper mill machinery has subcontracts for war work that utilize every division, every machine tool (plus some new ones) and every worker (including 100 more than in peacetime). Only ordinary retooling of equipment was necessary to switch from usual to war production. Only a few hours were required to prepare old employees for the new operations. New machines and labor were obtained to speed the program, and all old equipment is operating 24 hours per day.

Nearly two years ago this company realized that the U. S. would inevitably be drawn into World War II; it analyzed plant, equipment and personnel. Included in the facilities were a foundry, a machine shop, a pattern shop and an erecting floor—all in good condition, all of which the company wanted to maintain in operation, if at all possible. A further notation in the report was the fact that most previous work had been in cast iron and steel. Thus, it seemed advisable to seek out work in those materials, with which the working force was accustomed.

Receive Educational Order

All the data was mimeographed and bound. The report was taken to the district office of the Defense Contract Service (now the Contract Distribution Branch). After checking and rechecking lists of production facilities sought by the procurement agencies, it was decided that work on large assemblies for the Maritime Commission was best suited for this plant. Soon an educational order for eight units was obtained on a subcontract.

At the same time, the company analysis was supplied to the district office of Army Ordnance. This later resulted in an army request that the company work on tank parts on a subcontract.

As new equipment has been added to accommodate volume of work in the plant, the facilities report has been revised. So far two revisions have been made since the original in Oct. 1939, and a third is in preparation. The company's record on present contracts assures continuation of maritime and tank work. The facilities report, together with the experience record, will undoubtedly result in additional war orders. A bid has been made on shell manufacture at government request.

Obtaining Machine Tools

Machine tool equipment owned by the company includes engine lathes, turret lathes, vertical boring mills, radial drill, small vertical drills, multiple spindle drills, planers, millers, shapers, horizontal boring mill and roll and shaft grinders. The company had some of all these machines but had to get additional units to speed production, and it will have to get more planers, millers and vertical boring mills. Only three or four turret lathes are not working continuously—these are all operating 8 hours per day.

The labor force, all from the local area, has increased from 220 to 320. One solution to the shortage in the skilled labor market has been to hire automobile mechanics who are out of work due to the curtailment of car use. They have been placed on the erecting floor, freeing skilled machine operators for use in the machine shop. The personnel manager frequently looks over machine shop classes in a nearby high school, offers likely students jobs when they graduate.

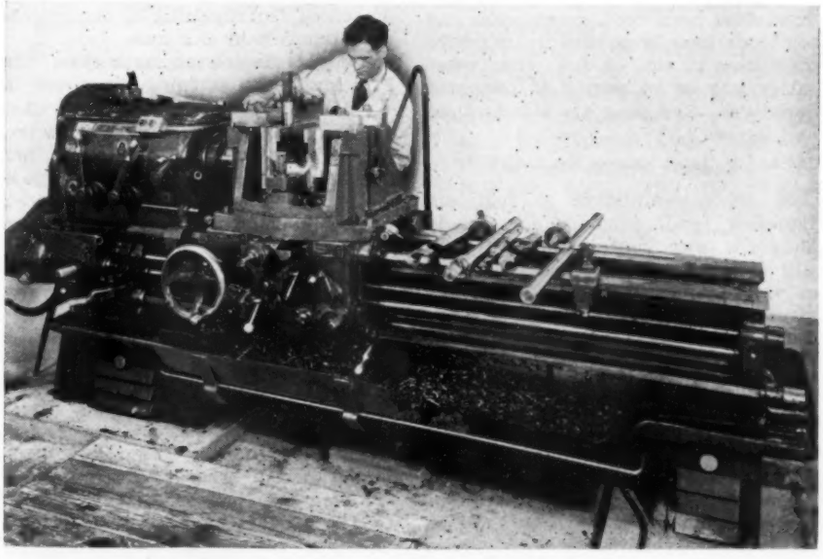
Have Priority Specialist

Re-subcontracting has been tried with success. Following careful study three nearby plants were given trial orders. One sub-subcontractor made scrap of four out of five units. But the other two have done well, and one will soon be shipping completed parts direct.

Materials turn out to be the toughest problem faced by the company, especially steel castings and forgings. Some A-1-a orders have had to be set aside pending receipt of materials. Furthermore, material that is late is used on parts requiring the most work. Meanwhile, lower rated orders are gotten out of the way. Foresight, however, saved the company much trouble over materials. Since their inception, one employee has made a thorough study of priorities and their many ramifications. He guided the firm past the pitfalls that trapped many companies.

Experience and engineering skill are pooled with other plants in the region which are doing similar types of work. Better, faster and easier methods are passed back and forth, all in the interest of increasing the Victory Program.

In World War I, the company made shell, bilge pumps, marine engines and machinery for processing gun cotton.



Converted Lathe Bores Gun Part—In tooling up to manufacture antitank guns, a large plant has converted several Reed-Prentice 20-in. engine lathes for drilling, boring, undercutting and finishing the actuating shaft hole in the nickel-chrome-molybdenum steel breech ring. A post under the lathe bed eliminates deflection caused by the heavy fixture

Draft Will Solve Canadian Labor Shortage
Production Concentration Aids Conversion

OTTAWA—An end of the major labor worry of Canada's war and essential civilian industry is expected to result from the Ottawa Government's plan for selective compulsory war service for factory and farm as well as for the armed forces. This plan, pending since late last year, is now the settled policy and the country is being searched for a suitable administrator for it. The choice may fall on Philip Chester, English-born Governor of Hudson's Bay Company.

Labor requirements of the Dominion's war production expansion program are placed at 100,000 new workers during the next six months. They would be larger but for the increasing shortage of steel, despite large increases in steel capacity at all major Canadian plants corresponding to upping of capacity in the U. S. Half the total of wanted war workers probably will be women. High wages and living cost bonuses in war plants have drained men from agriculture until scarcity of help on farms, with resulting advances in production costs and prices, have become a prime worry of Ottawa's anti-inflation administration:

Records Already Available

Industry heads heartily approve the selective draft system for filling labor needs. Basis of the manpower pattern will be the records of the Unemployment Insurance Commission which cover workers in all classes of industrial employment. These records have been used for some time as a guide in voluntary recruiting of war labor from non-essential industry. Non-essential plants have been compelled to turn their workers into war production in their own premises or release them to war plants by curtailment of their raw material supplies or arbitrary limitation of their consumer output.

As a prelude to the draft system the National War Labor Supply Council, composed of representatives of industry and organized labor, which has been responsible for maintaining war industry labor requirements since 1939, has been washed out.

Standardization Precedes Concentration

Conversion of more civilian plants to war production is planned by the special division of Wartime Prices and Trade Board recently organized. This program will be pushed ahead through standardization of consumer commodities. Officials predict it will extend to all industry capable of conversion. It has started with canned foods and clothing. As consumer commodities are standardized their production will be restricted to certain plants, other plants in the same industry being shifted to war work. Committees representing the various industries are hard at work with the control authorities on the standardization and doubling-up plan.

Because Minister C. D. Howe's Munitions and Supply Department has followed the practice of adjusting individual production problems as they arise, Ottawa has not found it necessary to adopt Donald M. Nelson's ban on bidding for war contracts. New contracts are still subject to bids from prospective contractors. But a very large proportion of Canadian war production orders is placed without bidding. Plants are selected by Howe's Department as the most suitable for certain kinds of production, told to go ahead with the job and work out a price arrangement with Ottawa's production chiefs.

Some Profits Limited

A company that has been successful in carrying out original orders for mechanical transport equipment or guns may be given new orders for the same equipment without bidding. For certain classes of production Howe has set up government companies and these have built plants and gone into production on British and Canadian government capital. Some private plants have been taken under partial or complete government control and these are given war jobs without tendering. In some cases Howe limits war contract profits on a percentage basis, although the pre-war limitation of 5 percent is not now in general application, having been found early in the war to be a handicap.

Manufacturers of cans in Canada have been placed under severe restrictions on the supply of cans for the 1942 packing season. Only four staple vegetables, peas, corn, green beans and tomatoes, may be packed in unlimited quantities in tin. A few other vegetables may be so packed in restricted quantities. Can sizes are standardized and limited.

Squeeze Profits Margin

In its determination to maintain Canada's retail price ceiling Donald Gordon's price control administration will subsidize domestic consumer goods as well as imports. With commencement of the price ceiling program Dec. 1, it was proposed to bonus essential imports where necessary to fit them under the ceiling but the freezing of producers' prices was expected to take care of domestic commodities. The new policy is to compel manufacturers and distributors to absorb as much of the profit squeeze as they can without having to go out of business and to take care of increased production costs which cannot be so absorbed by bonuses to bring the commodities under the ceiling. Part of the cost may be recovered by the government's requisitioning of the exchange premium on exports to the U. S.

Old Hands, New Trick—For years this worker carved horses for merry-go-rounds; today he operates this lathe, machining housings for Airacobra landing gears. Labor, too, has been converted to war

Brainard Asks Idle Machines Be Marketed for War Use

WASHINGTON — Owners of idle or broken-down machine tools have been asked by Chief George Brainard of the Tools Branch of the War Production Board to put them on the market so they can be converted to war use. Also, Brainard said, when a tool is only being used part time, manufacturers should combine the work of several machines and put the extras on the market. Brainard didn't say so in his letter to machine tool owners, but firms that fail to dispose of their excess tools are likely to be made to do so. Just a week earlier, legal restrictions that hitherto prevented requisitioning of many tools were removed by Congress.

Congress last year authorized the President (who assigned the power to WPB) to requisition any machine needed for war production. However, the law contained a clause saying that no tool could be requisitioned which is essential to the conduct of a business. Thus, a machine being used only a few hours a week could not be taken.

Seizure Permitted

The second war powers act, however, which has passed both houses of Congress, wipes out this restriction. It still provides that whenever a tool is requisitioned, a price must be paid for it based on the damage done to the business by its removal. However, if WPB wants to pay the price, it can now seize any tool it wants.

Brainard asked that those who have tools they are willing to sell report the fact to the Available Tools Section, War Production Board, Social Security Building, Washington. A separate report should be sent for each tool, on 8½ x 11 sheets, giving make, type, size, description, age and serial number.

INSIDE DETROIT

Auto industry needs millions of dollars of machine tools, despite retooling and rebuilding thousands of old machines. Find ways to shear, pierce, bend armor plate. Fisher frames ease shipping

BY RUPERT LEGRAND, DETROIT EDITOR

DETROIT—Mechanized war has no respect for popular notions on auto-plant conversion. Many thousands of auto-plant machines are in process of being retooled or rebuilt for munitions. But additional thousands of new machines, representing types and sizes not found in quantity in automobile factories, must be built in the next few months by the machine tool industry. The three major motor-car manufacturers alone will spend nearly a half billion dollars for new equipment and tooling.

At least $50,000,000 will be spent to rewire plants, buy motors and control equipment, expand transformer banks for increased power loads.

Buying programs for current war contracts run from seven to ten times annual appropriations for new motor-car machinery and tools. Great as the buying task is, it is being telescoped in point of time to meet the industry's pledge that full production will be reached by late fall. But this is not all. New projects are constantly being broached by Washington. Mistrust of the industry has given way to wholehearted approval and respect for the way seemingly impossible tasks are being absorbed. As a consequence, government planners are developing the habit of bringing their tough procurement problems to the industry's doorstep.

Government Goes to Industry

Suppose, for example, a bottleneck is foreseen in propulsion equipment for merchant shipping. All existing capacity for building one type of propulsion machinery is now overloaded, despite teriffic expansion. But perhaps a substitute type of equipment can be built by an auto plant. Will it look over approved designs?

Right away, the auto company knows it faces an "impossible" task. Investigation had already been made: it was known from equipment surveys that few of the huge planers and boring mills needed for ships' engines were to be found anywhere in the auto industry. Yet the proffered job is studied, equipment lists drawn up. To the pile of multi-page reports already compiled on equipment that must be bought, still another is added.

With the facts in its hands, government must make the decision whether or not the auto plant should take on the ship-engine job. The same applies to any one of a score of projects which is foreign to the manufacturers' set up but which he will gladly undertake if it is in the nation's interest that the project be assigned to him.

Retooling Ahead of Schedule

There is no reason to despair because mechanized war makes the nation's industrial joints creak. Investigation in the auto industry discloses that retooling of auto plants for war production is ahead of schedule. Newer jobs are taken on, too. They are put through the mill that has successfully coped with big retooling programs every year. Organizations have been expanded to digest processing layouts and tool procurement in an orderly, speedy and efficient manner.

A side-light on the fact that brains are being applied to save time, consider armor plate. People who have fabricated thousands of armored vehicles said that armor plate can not be sheared, pierced or bent (to save gas cuts and welds). Two days of experimentation proved these ideas false. Armor plate can be sheared, it can be pierced, and it can be formed or bent with properly designed tools. And the tools are being built right now. What this one example of original thinking means in saving time in building armored vehicles will be appreciated by the production man.

Design Shipping Frames

As result of long experience gained in shipment of automobile body parts, Fisher Body has developed a new method to insure safe transport of bomber sections. For use in shipment of automobile body parts, Fisher had devised steel-frame containers which materially lessened the danger of damage in transit. These containers now have been converted for shipment of aircraft sections from fabricating plants to final assembly hundreds of miles away.

Plane part transportation formerly was handled by means of wooden crates built around the sections to be shipped. In shipments of sections built on a mass production basis, wooden crates would require excessive frame construction work, heavy charges because of the greater weight, and the complete loss of the wooden material at the destination since it would be impractical to return the crates for repacking. Shipments by wooden crates, required from two to three pounds of dunnage for each pound of goods. The new steel containers have lowered that ratio to about 1.5 pound of dunnage to one pound of goods. Since the steel containers are used over and over, there is no loss of dunnage after shipment.

Straps Absorb Shocks

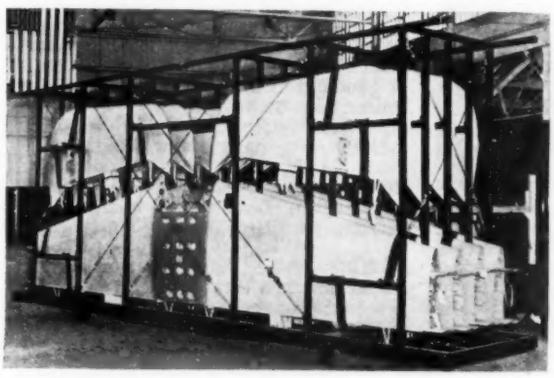
Within the Fisher plant where bomber parts are built the containers are loaded with wings, rudders, stabilizers, ailerons, or whatever parts are to be shipped. Each part is held in place with strong elastic straps which absorb impact during transport. The containers are equipped with rubber-mounted "knee-action" casters.

Several containers are shipped in cars equipped with special brackets. These firmly grasp the containers at each end while a horizontal jack between the containers keeps them securely locked within the brackets. This device gives protection against forward and backward or up and down motion, while tracks which lock the containers' casters prevent sidewise sway.

G.M. Decides to Help

More than 50 percent of nearly 2,000 white-collar employees laid off by General Motors in the shift from automotive to war production have been placed in jobs with government agencies and other employers. Included in this group are sales, service, accounting and financial personnel who lacked training of value on defense. But since these employees represented trained people which the corporation wants to rehire after the war, the G.M. management decided that the best way of creating goodwill so that the majority will want to return was to help them now.

An organization capable of handling



Safe Riding — Parts for U. S. bombers are packed in special shipping frames for transportation from the Fisher Body plant to a final assembly factory. Elastic bands hold each part securely to prevent damage

the re-employment problem on a community and national basis existed in the clearing point system established in 1940. Until Pearl Harbor the system operated to retain if possible the services of a satisfactory employee laid off by reason of retrenchment in a specific operation. In each community in which two or more G.M. operations are located, a full or part-time man devotes his attention to making the laid-off employee's record and qualifications known to all plant managements in the area. Responsibility for determining whether the individual suits the job specifications lies with the plant manager concerned.

Look Over Government Openings

When the emergency arose in December it was easy to modify operation of the clearing point system, so as to discover employment opportunities outside the corporation. G.M. saw as its first responsibility the task of finding out what types of personnel are required by government agencies, and carefully screening records of laid-off employees so that suggested job applicants would closely match requirements.

A full-time man in Washington sought out the opportunities; Detroit central office scanned records compiled on a national basis. Laid-off employees were discouraged from making direct application to Washington, unless specifically requested to do so. Clearing-point managers also work with local government agencies. Nearly half of the personnel placed by March 1 went into government service.

Most clearing-point managers are chosen from managers or assistant managers of General Motors Acceptance Corporation offices throughout the country, on the basis that these men have a thorough knowledge of all corporation activities in their areas. Since G.M.A.C. men also have wide contacts with other industries and business enterprises, several hundred jobs were found among private employers.

The clearing point system was set up originally to handle only personnel who had given satisfaction to corporation units and has not offered deadwood to outsiders. G.M. executives are of the opinion that 70 percent of white-collar lay-offs will be placed, on the basis that the group possesses administrative ability of value to other employers.

REMOVE TOWNS FROM LIST

WASHINGTON—Last fall the then Office of Production Management instructed the War and Navy departments to give special preference in the award of contracts to some fifty towns where serious priority unemployment existed (*AM*—Vol. 86, p. 936c) and to the household washing machine industry. The War Production Board has now announced that the industry and five of the towns—Meadville, Pa., Newton and Kellogg, Iowa, Mansfield, Ohio, and Eaton, Ga., can be removed from the list.

WAR ORDERS IN BRIEF

JEWEL BEARINGS — Conservation Order M-50, prohibits use of large ring jewel bearings or vee jewel bearings except on orders with a priority rating of A-9 or higher.

BOILERS — Limitation Order L-42, eliminates metal jackets, fusible plugs and tri-cocks from low pressure heating boilers manufactured after June 1.

COPPER—An amendment to Conservation Order M-9-c permits use of copper for essential operating parts for railway locomotives, cars and equipment.

CUTTING TOOLS — Supplementary Order E-2-a, directing the use and distribution of cutting tools, has been extended to remain in effect until revoked. Beginning July 1, manufacturers of cutting tools must use the production requirements plan to obtain priority assistance.

FARM TRACTORS — Supplementary limitation Order L-26-a prohibits production of farm tractors requiring rubber tires after May 1.

FIRE ARMS—Limitation Order L-60, bans manufacturers sale and distribution of new pistols, rifles or shotguns, except to federal, state and local government agencies.

FIRE APPARATUS—Preference rating Order P-45 assigned an A-2 rating for material used in the manufacture of motorized fire apparatus on war orders.

LEAD—The March lead pool was set at 15 percent of January production.

LIFT TRUCKS — Preference rating Order P-40, granting an A-1-g rating for materials used in industrial lift truck manufacture, is extended until May 10.

METAL-WORKING—Preference rating Order P-11-a, assigning ratings of A-1-a, A-1-b, and A-1-c to producers of metal-working equipment, has been extended to June 30.

MINE REPAIRS—An amendment to preference rating Order P-56 grants an A-1-c rating for repair and maintenance of essential mine machinery for mines producing essential materials such as copper, coal and iron. An A-8 rating is assigned for non-essential mining purposes or else ratings are removed.

RADIOS — Supplementary limitation Order L-44-a stops manufacture of radios and phonographs for civilian use after April 22.

REFRIGERATORS—An amendment to limitation Order L-5-c prohibits refrigerator manufacturers from disposing of inventory materials on the parts, except to other refrigerator companies, or for repair and maintenance. An amendment to limitation Order L-5-b permits the Army, Navy and Maritime Commission to obtain new refrigerators without specific permission from the War Production Board.

STEEL — Supplementary limitation Order L-2-a permits automobile companies to sell alloy steels to industries possessing an A-1-k or higher preference rating, and all other steel to persons holding an A-3 or higher rating. Amendment 3 to supplementary Order M-21-b prohibits warehouses from accepting delivery of steels in excess of assigned quotas.

TRUCKS, BUSES—Conservation Order M-100 establishing rationing form for new trucks, truck tractors and trailers. Preference rating order P-54 granting an A-3 rating for materials used in the manufacture of truck-trailers and buses, has been extended until April 30. An amendment to limitation Order L-35, and to preference rating Order P-107 raises from A-3 to A-2 a preference rating available for deliveries of materials used in the manufacture of parts for trucks, truck-trailers and buses. Medium truck construction is prohibited after completion of February quotas.

PRODUCTION—Monthly reports of conversion to war work must be filed with the War Production Board on Form WPB-732, under an order issued by Donald Nelson.

ALUMINUM PAINT—Supplementary Order M-1-g places aluminum paints and pigments under a complete allocations system.

AIRCRAFT—Preference Rating Order P-122 raises to an A-1-a or A-1-b all ratings on military or naval aircraft assigned by any previously issued preference rating certificates: PD-1, PD-1-a, PD-3, or PD-5. Combat craft get the A-1-a rating, while trainers receive the A-1-b rating. Last month's Order P-109 assigned A-1-a rating to certain types of aircraft. Priority rating granted commercial airlines has been raised from A-3 to A-1-j by amendment of Order P-47.

TELEPHONES — Limitation Order L-50 directs telephone companies to conserve materials by discontinuing conversion of manual to dial systems, replacement of wall and desk phones and installation of private extensions.

WASHING MACHINES—Large manufacturers of washing machines may produce one and one-half their February quota of machines between March 15 and April 15. Ultimate halt of production is assured by the War Production Board.

RADIO—No materials will be made available by the War Production Board for the construction of new broadcasting facilities or changes in existing facilities.

PRICES—Price Administrator Leon Henderson has established a uniform procedure for requesting modifications and exceptions to price schedules.

WARTIME WASHINGTON

Army reorganization affects production. Agitation for separate air force based on misunderstandings. More civilians join procurement staffs as supply services are unified, streamlined

BY BLAINE STUBBLEFIELD

WASHINGTON—President Roosevelt's reorganization of the Army is an important and aggressive move, affecting the production as well as the military side of our war.

The Commander in Chief's purpose in creating the new Army, approved by the attack-minded members of the general staff, is to separate the fighting forces from the supply forces. Neither will have to worry about the duties of the other under the new setup.

The new Army has only three basic units: the Ground Force and the Air Force compose the fighting end, and the Service of Supply is the where-with-all end.

Artillery, Infantry, Armored Force, Cavalry, etc., still exist and function as such, and it is proper to refer to them as such. But they receive their orders direct from the chief of the Ground Force, under a coordinated plan of Army action.

Air Force, Ground Force, and Supply are each independent of each other, but they will work in close coordination under the command of Army Chief of Staff George Marshall. Right now there is no commanding general of the armies, but there probably will be one before this country goes into full offensive action on world-wide fronts.

Independent Air Force Bypassed

This reorganization does not provide the "independent" air force which some congressmen and others have been clamoring for. However, the Air Force is definitely geared tactically to the other two forces. Furthermore, the demand for a separate air command is and has been largely based on a popular misunderstanding of foreign military powers. German and Japanese air arms have no more autonomy than ours has under the new setup. The Royal Air Force is the only independent air power in the world, and even it is coordinated with other arms by the general staff. Over against its victories the RAF has suffered several defeats, which appeared to be chargeable to lack of teamwork with the Army and Navy.

May Transfer Plane Procurement

The United States Army Air Force, as reorganized last year, consisted of two parts: the Air Force Combat Command, and the Air Corps. The Combat command was to do the fighting, and the Air Corps did the training, ferrying, maintenance, design and procurement of planes. Air Corps is abolished.

As newly organized, the four combat air force commands and most of the functions of the former Air Corps will report as single units directly to the Chief of the Air Force, through an Air Staff. It seemed probable at this writing that procurement of airplanes would be transferred to Army Service of Supply, leaving an airplane design unit in AAF. But this might not be done for some time, as the Army has too much reorganization to digest all at once.

Consolidate Supply Service

Most immediately important to industry is the new Service of Supply. Under Gen. Brehon B. Somervell, a brilliant engineer officer, the new unit brings together the Quartermaster Corps, Bureau of Ordnance, Corps of Engineers, the Signal Corps, Medical Corps, Chemical Warfare, procurement functions of the Coast Artillery, and two new services, a division of transportation and a division of general depots.

For a while at least, these agencies will function much as before. Firms doing business with the government will see the same people and go through much the same motions. But gradually the effects will be felt of a new civilian policy-setting body attached directly to Gen. Somervell. This body, the Division of Procurement and Distribution sets policies on design, procurement and production control, and reviews all contracts. It is headed by a recently called up reserve officer, Col. Charles D. Young. Young was vice-president in charge of purchases of the Pennsylvania Railroad. Deputy to Young is Douglas MacKeachie, until this month the War Production Board's director of purchases.

Under these men production is the responsibility of Gen. T. J. Hayes, a regular officer, assisted by A. R. Glancy, Pontiac executive who was in charge of ordnance for the old National Defense Advisory Committee and Office of Production Management. Albert J. Browning, a former assistant to MacKeachie in WPB, is in immediate charge of purchasing.

Organization of this new division parallels the formation of a similar unit in the Navy, headed by Admiral Samuel

Building Lightning—Here is a section of the "Lightning" P-38 assembly line in a Lockheed aircraft plant, where production goes on endlessly. This is only one of the many lines turning out fighting ships for United Nations' air forces in the six Lockheed and Vega factories. Many additions to these plants are nearing completion

Robinson and largely staffed by civilians. These two outfits, working with the WPB, have accomplished a bloodless revolution putting in civilian hands the policy-setting powers.

Ministry of Supply Possible

Assignment of MacKeachie to the Army unit, suggests that this group is being built up to form the nucleus of a future independent procurement body. Eventually, it will probably be cut loose from the War Department, absorb the Navy unit, perhaps take on personnel from the Maritime Commission and Treasury Procurement branch, and become a real Ministry of Supply.

In this connection it is significant the Army reorganization has segregated the strictly military phases of procurement—establishment of specifications and quantity schedules for armament.

Priority Violators Face Fines, Jail Under Second War Act

WASHINGTON—Criminal penalties—fines and jail sentences—may be imposed on violators of priority regulations as soon as the President signs the Second War Powers Act. The measure also makes compulsory the acceptance of Lend-Lease and war sub-contracts. Previously only direct government war orders had to be accepted.

Only penalties readily available against priorities chiselers in the past have been to stop their supplies of materials. But in a period when maximum production is the goal, such penalties are likely to hurt the war effort as much as they do the guilty party.

Technical changes recently made in priorities procedure include a grant of authority to the Selective Service System to issue PD-3A priority ratings. Procurement Division of the Treasury and Surplus Marketing Division of the Department of Agriculture also get this authority as far as orders they place for Lend-Lease are concerned.

Another new rule provides that a person on whom an AA priority rating is served may only extend it as an A-1-a rating if he is able to fill the order placed with him out of his inventories. This is to prevent unnecessary use of the emergency rating.

Most War Plant Expansion In Metal-Working Industries

WASHINGTON — Two-thirds of the $7,365,971,000 expansion of war production facilities has occurred in the metal-working industries. Value of metal-working expansions, with public and private funds, to December 31, was $4,916,609,000. Aircraft facilities cost $1,066,621,000, leading the metal-working expansion.

Facilities for constructing and repairing ships followed with $858,518,000, while funds for the production of iron and steel products were a close third with $855,718,000. Expansion of the non-ferrous metal group totalled $676,247,000. Ammunitions, shell and bombs are next, followed by guns, machinery and electrical equipment, combat and motorized vehicles, and machine tools, and other metal-working equipment. The $95,127,000 expansion in the last category was 68 percent privately financed, whereas only 18 percent of all industrial plant expansion were not financed with public funds.

MORE SIMPLIFICATION AHEAD

WASHINGTON — Simplification programs developed by the Bureau of Standards — schemes to reduce the number of sizes and styles of such things as bolts and nuts, nails, pipe, and the like—are getting a new lease on life from the war. WPB is seizing on them as a means of conserving materials (by eliminating inventories of little-used types) and of economizing on production capacity. Idea is to have WPB issue orders making compliance with Bureau simplification programs, always voluntary in the past, compulsory.

UNEMPLOYMENT NEARLY OVER

WASHINGTON—The end of unemployment is in sight in the opinion of the Labor Department which reports up to 15,000,000 women may be working in war industries by the end of 1943. Six million may be absorbed without interruption to families. Though 500,000 are already in defense work, the Works Progress Administration is training women through local public vocational schools, and those attaining sufficient skill will be placed in jobs the same as men. Women with dependents will be given priority.

Plane Makers Got Material Despite Lack of A-1-a Rating

WASHINGTON—Warplane production was not seriously curtailed by the War Production Board's delay in giving the industry an A-1-a preference rating. This opinion is stated by informed officials here.

The outcome was partly good luck. Airplane manufacturers had large stocks of materials on hand. Then too, as most war contractors know, the priorities system is not airtight; many firms having connections got what they wanted, "P" orders or not.

About 90 per cent of the aircraft industry was operating on an average rating of A-1-d, while some other war items had A-1-a. Officials said that some manufacturers' procurement men saw the bottom of the stockpile coming, but managements in general were little concerned. In Army-Navy-Air Force conferences aviation was outranked.

When a few shortages actually showed up, the industry turned the heat on, with positive assurance that the public would be strongly sympathetic with aviation. Whether Nelson's action in raising the airplane rating to top position was taken against strong military opposition is not known.

British Combine photo

Bomber Line—Fuselages are moving along three production lines in a "Sterling" bomber factory in England. In the background are wing sections also on production lines. A little farther along complete bombers are assembled to carry the war to the Axis

Head Fisher War Production Divisions

A. J. FISHER

D. S. HARDER

G. S. CASHDOLLAR

E. R. LEEDER

J. J. WALLBILLICH

NAMES in the NEWS

A. J. Fisher has been named Director, Aircraft Section, Fisher Body Div., General Motors Corp. Others appointed section directors are Del S. Harder, tank section, with G. H. Kublin as chief engineer; G. S. Cashdollar, one artillery carriage section, with F. B. Harrington as assistant and Bert Cotter as chief engineer; E. R. Leeder, a second artillery carriage section, with H. D. Burnside as assistant and Albert Haberer as chief engineer; J. J. Wallbillich, ordnance specialties and machine section.

T. A. Lynch has been elected a vice president, Reynolds Metals Co. He had been sales manager to the aeronautical industry for Reynolds.

John H. Chaplin has been elected executive vice-president, Veeder-Root, Inc., while Harry L. Spaunberg has been elected vice president and Charles F. Pendlebury was named secretary. All three were connected originally with the Root Co., which was merged with the Veeder interests in 1928 to form Veeder-Root, Inc.

Edwin H. Brown has been elected vice-president in charge of engineering and development, Allis-Chalmers Mfg. Co. Mr. Brown, who was manager and chief engineer of the engine and condenser department, will correlate engineering activities and the development of new products. He joined the company in 1906. The administration of the engine and condenser department has been taken over by M. L. Carson, sales engineer. Ralph R. Newquist, who was manager of the district office at Houston, Texas, has been named assistant to vice-president Walter Geist. Mr. Newquist joined the company in 1934, and served in several district offices.

A Donald Armitage has been elected president, J. H. Williams & Co., succeeding the late J. Harvey Williams. Mr. Armitage had been vice-president of the company, and will be succeeded in that position by William C. Kress.

Joseph M. Barr and James J. Gaffney, have been appointed assistant general managers, Vought-Sikorsky Aircraft Corp. Mr. Barr will continue as Factory Manager, while Mr. Gaffney will relinquish his postion as assistant treasurer. However, he will continue as division accountant. Mr. Barr has been associated with United Aircraft since 1932, and Mr. Gaffney since 1929.

Ernest R. Breech, formerly vice-president, General Motors Corp., has been elected president, Bendix Aviation Corp. He succeeds Vincent Bendix, who becomes chairman of the board. Mr. Breech is chairman of the North American Aviation, Inc., and was president of that company before joining General Motors in 1935. He has also served as president of Transcontinental & Western Air, Inc., and Western Air Express.

William S. Ford, president, William S. Ford, Inc., is joining the Trundle Engineering Co., as vice-president in charge of the Chicago Office.

D. Edwin Gamble, vice-president and general manager, Borg and Beck Div., Borg-Warner Corp., has joined the Ordnance Branch, Production Div., War Production Board.

Ronald R. Monroe has been elected vice-president in charge of manufacturing and purchasing, J. G. Brill Co.

Advanced by Allis-Chalmers

R. R. NEWQUIST

E. H. BROWN

William S. Howe is retiring as president and treasurer, Production Machine Co. He has been at the head of this company since its inception, 25 years ago. Mr. Howe will continue to operate Howe & Son, which he owns.

P. H. Lauder, for six years engineer of General Electric Co.'s Pittsburgh office, has been appointed assistant to William M. Denny, assistant manager, Contract Service Department, Schenectady.

Theodore W. Monroe has been elected president, Hartford Electric Steel Co., succeeding the late Edmund S. Gardner. Mr. Monroe was also elected president of Roxbury Steel Casting Co., an affiliated concern.

Edward Riley has been elected vice-president, General Motors Corp., succeeding Graeme K. Howard, who is serving in Washington as Deputy Chief, Motor Transport Div., Quartermaster Corps, U. S. Army. Mr. Riley had been general manager of General Motors Overseas Operations.

Ralph B. Rogers has been elected president of the Hill Diesel Engine Co., recently purchased by the Edwards Co. Mr. Rogers is also president of the Edwards Co.

George Rommey, for several years Detroit manager, Automobile Manufacturers Association, has ben appointed general manager of the AMA, succeeding Pyke Johnson. Mr. Johnson resigned to become president of the Automotive Safety Foundation. Mr. Romney was appointed managing director, Automotive Council for War Production, in January, shortly after that group was organized. Prior to his affiliation with the Automotive Industry, he represented the Aluminum Co. of America and the Aluminum Wares Association in Washington.

Richard G. Taylor has been appointed assistant to A. V. Murray, Secretary, Scaife Co. Mr. Taylor was with the LaSalle Steel Co. of Chicago.

Russel R. Vought has been elected vice-president, United Aircraft Service Corp., a subsidiary of the United Aircraft Corp.

BUSINESS ITEMS

The American Swiss File & Tool Co. announces the appointment of Barnard S. Meade as sales representative to mill supply houses. Mr. Meade was formerly connected with Syracuse Supply Co. and Charles Parker Co.

The Buda Co. has transferred Norman E. Donnelly to its Washington office, where he will be in charge. Mr. Donnelly will be assisted by V. D. Lake, for three years sales engineer. Col. H. H. Frost, vice president, formerly in charge of the Washington office, has returned to active duty in the U. S. Army.

The DeVilbiss Co. has moved its St. Louis, Mo., sales and service branch to 2737 Washington Ave.

Gar Wood Industries, Inc. has appointed H. H. Crow Equipment Co., 216 East 4th St., Little Rock, Ark., as distributor for the hoist, body and tank divisions.

General Electric Co. has named Harold M. Towne manager of sales for lightning arresters and fuse cutouts, and Max I. Alimansky manager of sales for capacitors.

Hygrade Sylvania Corp. has announced the appointment of R. F. Hartenstein as special representative.

Jones & Laughlin Steel Corp. has appointed C. M. Mason district sales manager in Cleveland, Ohio, succeeding E. A. France, who retired after 37 years of service. E. H. Hughes succeeds Mr. Mason as district sales manager in Buffalo. Mr. Hughes had been district sales manager in St. Louis and will be succeeded in that position by L. S. Berkey, former resident manager in Toledo. E. S. Lewis takes over the latter position. P. B. Turner has been appointed manager of export sales. Assistant managers appointed for Cleveland and Buffalo are, respectively, H. B. Shephard, G. G. Marshall.

The Lincoln Electric Co. has moved six of its offices. The new addresses are: 19 North Ellison St., Oklahoma City, Okla.; 733 North Van Buren St., Milwaukee, Wis.; 1111 James Building, Chattanooga, Tenn.; 323–325 East 23rd St., Chicago, Ill.; 521 South 15th St., Omaha, Neb., and 246 Wiltshire Boulevard, Dayton, Ohio.

The Watson-Standard Co. has opened new offices at 2 Lafayette St., New York, N. Y., under Raymond Swan.

OBITUARIES

Henry M. Lucas, 73, president and co-organizer, The Lucas Machine Tool Co., died March 2 in Cleveland. He was one of the machine tool industry's outstanding pioneers and served as president of the National Machine Tool Builders Association in 1926. Mr. Lucas began his career in the machine tool industry with Warner & Swasey in 1886 where he rose to the position of foreman, and, after night study, to chief draftsman in the engineering department.

With a brother, George C. Lucas, and Frank Yost, he organized the Lucas Machine Tool Co. in 1900. The firm first built special machinery, but soon manufactured the first Lucas-type horizontal boring mill. Although many improvements have been made, the basic principles of the original machine are retained today.

H. M. LUCAS

Eugene L. Bayliss, former assistant production manager, Harrison Radiator Corp., died recently in Lockport, N. Y.

Andrew Christianson, 74, chief engineer, Pullman-Standard Car Mfg. Co., died March 5 in Battle Creek, Mich. He designed and built the first all-steel passenger car in the United States. Born in Norway, Mr. Christianson came to the United States in 1893, entering the railroad business as a laborer.

H. L. Harrison, Ohio representative, Darwin & Milner, Inc., died March 3 in Lakewood, Ohio.

MEETINGS

American Foundrymen's Association. Annual convention. Cleveland, Ohio. April 20-24.

American Gear Manufacturers Association. Annual Convention. Hotel Hershey, Hershey, Pa. May 11-13.

American Iron & Steel Institute, General Meeting. Waldorf-Astoria, New York, N. Y. May 21.

American Management Association. Production Conference. Hotel Astor, New York, N. Y. May 13-14.

American Society of Tool Engineers. Annual meeting. St. Louis, Mo. March 26–28.

Chamber of Commerce of the United States. Annual Convention. Washington, D. C. April 27-30.

Society for the Advancement of Management. Semi-Annual Meeting. Hotel Gibson, Cincinnati, Ohio. May 7-9.

National Electrical Manufacturers Association. Annual Meeting. The Homestead, Hot Springs, Va. May 10-16.

SHOP EQUIPMENT NEWS

Barney Machinery Offers Complete Line Of Heavy Machines For Shell Production

A complete line of extra-heavy machines for shell production is offered by the Barney Machinery Co., Union Trust Bldg., Pittsburgh, Pa. The design of these machines calls for simple operations, as they were planned to be put in production in the least possible time and with green help. They are single-speed machines with proper sheaves to operate at the correct speeds for the various operations. Large diameter spindles are furnished, carried on Timken bearings front and rear. Headstocks are either conventional type or hollow spindle type, the hollow spindle being used in each case where a collect chuck is required. Feeds on all machines are hydraulic unless otherwise noted in the description of the operation. Heavy construction is used throughout to provide for the use of carbide cutting tools and higher cutting speeds. A brief description of the operation performed by the various machines follows:

Centering and Cut-Off—The forging is placed on an air-operated expanding mandrel, and a second air valve moves the carriage to center position. Center drill is started by pushbutton control, and an oil hydraulic valve is opened, starting drill feed. A stop terminates the drill feed, and a second oil hydraulic valve starts the cut-off tools.

Rough Turn and Face Base—Three to six rough-turning tools are used, depending upon the shell being turned. Only one pass is required to rough turn the contour. The cylinder which actuates the roughing tools moves the tools together with the contour cam forward until the tool carriage is stopped at the proper depth by stop screws. From this point the contour cam actuates the tools as they feed lengthwise along the shell until stopped by stop screws. The facing tool is fed into its cut by a hydraulic valve.

Machining Shell Nose—The shell is held in an air-operated contracting collet. The carriage is furnished with three-position tool holder, adjustable crosswise to definite stops. The first position is for rough drilling and facing nose end of shell. The second position of the tool holder carriage finishes boring and finishes facing for the nose end. The third position carries the blending tool or "spade" tool which is used where necessary for blending inside contour and removing excess metal caused by hot nosing. This last is a hand feed operation.

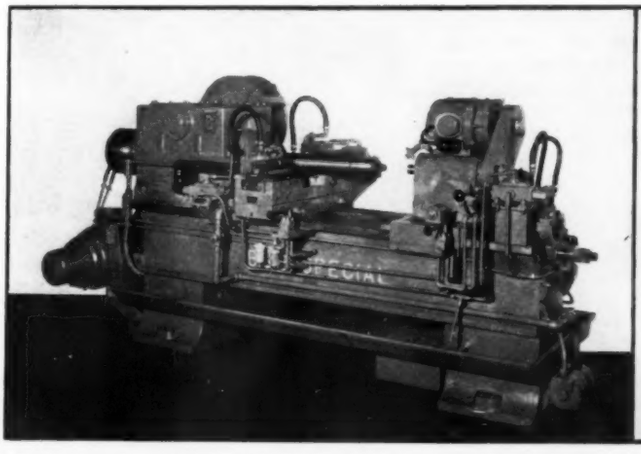
Finish Turning—The shell boat tail is placed in the headstock driver and centered with the hydraulic operated tailstock centering plug. The cylinder which actuates the three finishing tools, moves the tools together with the contour cam, forward, until the tool carriage is stopped at the proper depth by stop screws. From here the contour cam actuates the tools as they feed lengthwise along the shell until stopped by stop screws.

Face Base and Turn Boat Tail—The shell is held in an air-operated contracting collet. The tool carriage is advanced by means of a hand-wheel, until a stop gage on the carriage comes against the shell. The tools are then in proper position to make the cut. A hydrualic valve feeds the tools into the work.

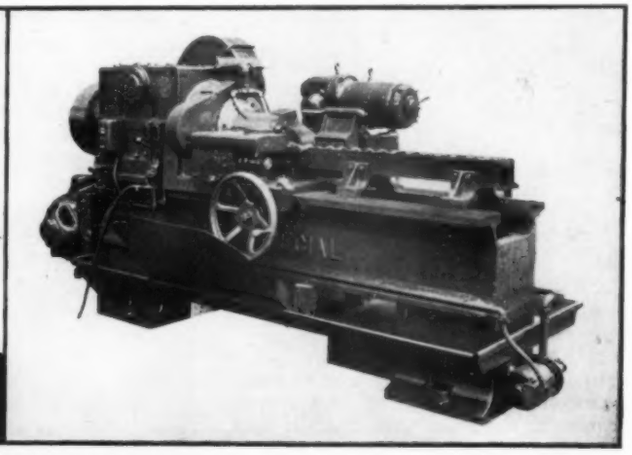
Turning the Band Groove—The shell is held in an air-operated contracting collet in the headstock. A hydraulic valve feeds the band grooving tool until halted at the proper depth by a stop. After the grooving tool has returned to its original position, an air valve starts the knurling tool feeding until it also hits a stop.

Profiling Inside Nose Contour—Due to the hot nosing operations in shell forging, a small percentage of the forgings require machining of the inside contour for weight correction. The shell is held in an air-operated contracting collet in the headstock. The tool carriage is fed by hydraulic feed, and the boring tool bores the inside contour, guided by a former, which is finished to the correct inside contour of the shell forging.

Tread Milling—The shell is loaded by placing nose in an outboard bearing centering die and the clamping shell with air-operated headstock driver. The hob is moved to starting position within the shell nose, and the hob motor is started. The operator then starts the headstock motor, which revolves the shell, and immediately moves hob into depth with handwheel. The thread is chased by means of a leadscrew driven from the headstock spindle. Threading is complete when



First of the Barney Shell Production line is this machine for centering the base and cutting off the skirt or open end



The band groove is turned on this machine which can handle any size shell from 75 mm. to 155 mm. Facing the base can be combined with this operation

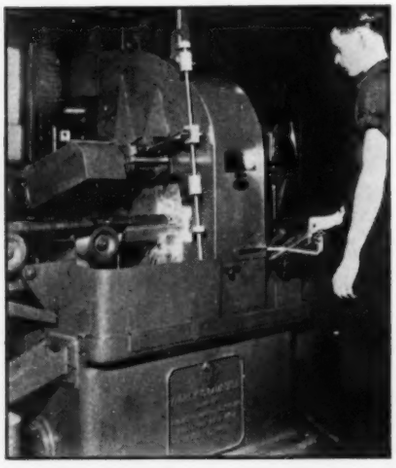
shell has made 1¼ rev. Rotation of the shell is stopped by means of a limit switch.

Turn Bourrelet—The shell is placed in the headstock drive and centered with the hydraulic operated tailstock center. The bourrelet turning tool is advanced to the proper depth by a handwheel, where it is stopped by a stop screw. The hydraulic cylinder then moves the tool lengthwise along the shell until the carriage is stopped by stop screws.

Turning the Driving Band—The shell is held in an air-operated contracting collet chuck. The turning of the band is all accomplished by hand feed, rough turning tool being carried in the front with a skiving tool which gives the required shape of the band carried underneath and two tools carried at the rear for trimming the sides of the band. These two tools come against pin sticks, which are carried in the rear tool holder, and which ride against the surface of the finished shell, and prevent the trimming tools from digging in the shell body.

Campbell Oscillating Cutalator Takes Rapid Cuts in Metals

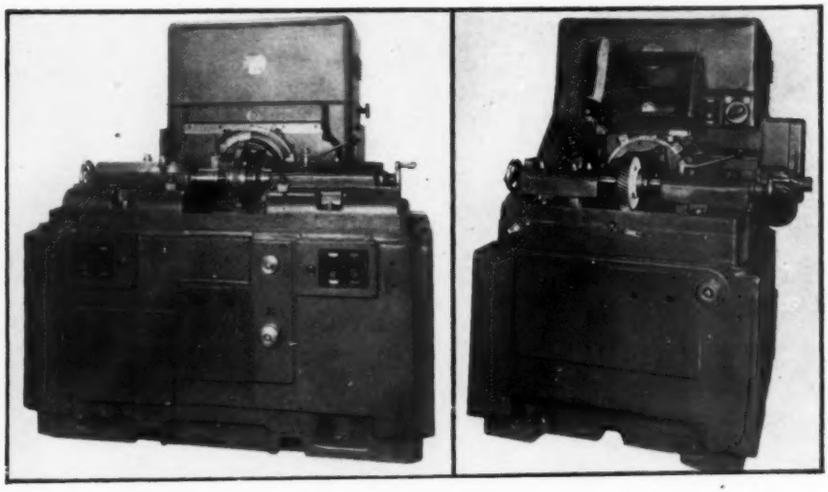
Almost all materials up to 3½ in. diameter in solid stock and 4½ in. in diameter of tubing can be cut with the No. 425 Cutalator, announced by the Andrew C. Campbell Div., American Chain and Cable Co., Bridgeport, Conn. It is an oscillating type machine with a short arc of contact permitted by the combination oscillating and rotating movement of the hydraulically fed wet abrasive cutting wheel. Hydraulically operated work clamps and V-type work holders securely hold the work being



cut. A micrometer work stop assures rapid set up. Hydraulic stop remover, work clamper and wheel feed are included in the equipment. Coolant tank, separate from the main unit, is mounted on casters. Controls are centralized on the front of the machine for easy operation.

Fellows Gear Finishing Machines Have Complete Electrical Control

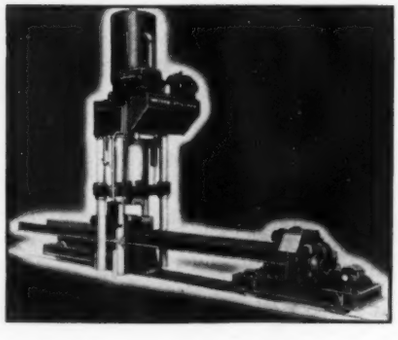
Two gear-finishing machines, designated as Nos. 12 and 24, have been announced by the Fellows Gear Shaper Co., Springfield, Vt. The electrically-controlled No. 12 machine finishes gears with maximum pitch diameter of 12 in., face width of 3 in., and 6 diametral pitch. Tool advances into the work through a feed cam which is so arranged that the tool makes two complete cycles and stops automatically. Direction of rotation is controlled through pushbuttons. Length of the reciprocating tool slide is regulated through dogs and micro-switches. Safety switches stop the machine automatically when any of the other units fail. Periods of dwell at the end of each stroke are governed by a timing switch. The No. 24 machine finishes gears having a maximum pitch diameter of 24 in., face width of 5 in., and 4 diametral pitch. It differs slightly in design from the No. 12 unit. On both of these machines, the work is supported on live centers held in adjustable head and tail stock. Table carrying head and tail stock is adjustably mounted on the base so that taper in gears can be corrected.



Heavy Straightening Press Offered By Watson-Stillman

Shafts 12 to 18 in. in diameter can be straightened by this 1,000-ton straightening press, developed by the Watson-Stillman Co., Roselle, N. J. Shaft length can vary from 7 to 60 feet. Entire operation can be handled by one man at the central control panel. For handling and positioning work there are two sets of rollers, each mounted on a hydraulic lifting ram which in turn is mounted on a motor-driven carriage running on rails between the columns. One set of rollers is motor-driven to rotate the work as required.

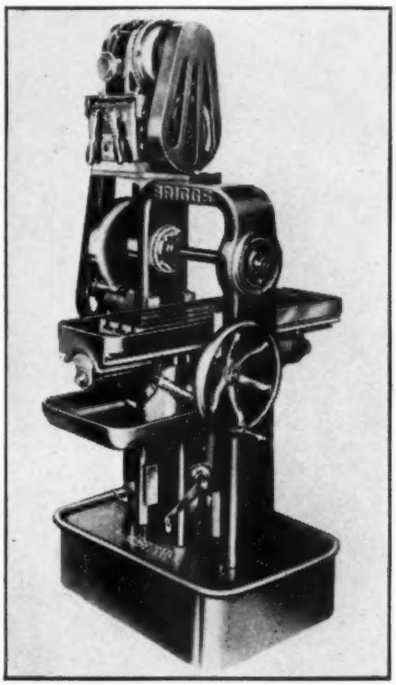
When the work is positioned, the lifting rams under the rollers lower it onto two bending blocks, each independently motor-driven for separation adjustment from 2 ft. 3 in., to 18 ft. Pressing speeds are 470 in. per min. advance, 15½ in. per min. pressing, and 470 in. per min. return. Stroke is 38 in. with an opening of 48 in. Press proper takes 8 × 24 ft. of floor space, and is 28 ft. high over all (21 ft. above floor).



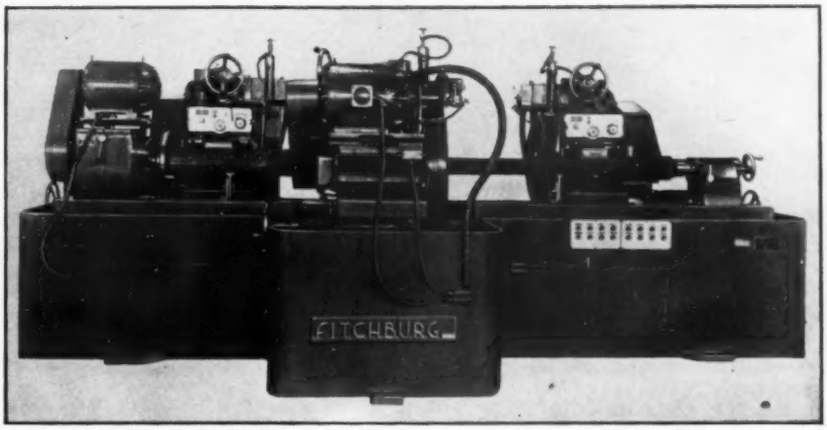
Bradley-Made Briggs Miller Takes Climb-Milling Cuts

Heavy cuts can be made without chatter, with the cutter rotating in either direction, on the No. A-2 Briggs miller made by C. C. Bradley & Son, Inc., Syracuse, N. Y. Climb milling is practical on many types of metal with consequently longer cutter life. The table feeds hydraulically with feed rates ranging from 0 to 25 in. per min. Eight spindle speeds ranging from 46 to 176 r.p.m. are provided by a 3- or 5-hp. motor. Table has a maximum travel of 20 in. Maximum distance from

arbor center to table top is 13 in., and the working surface of table is 30 × 8 in. Longitudinal movement of the arbor is provided in increments of 0.001 in. Arbors are available in diameters of 1, 1¼, 1½ and 1¾ in. and may be changed readily to the outboard frame



bushing. Cutters up to 6¼ in. in diameter may be inserted already mounted on the arbor, while cutters up to 13 in. in diameter may be used by threading the arbor through the cutter. Centrifugal coolant pump has a separate motor drive. The miller occupies a floor space of 42 × 60 in. weighs 2,500 lb.

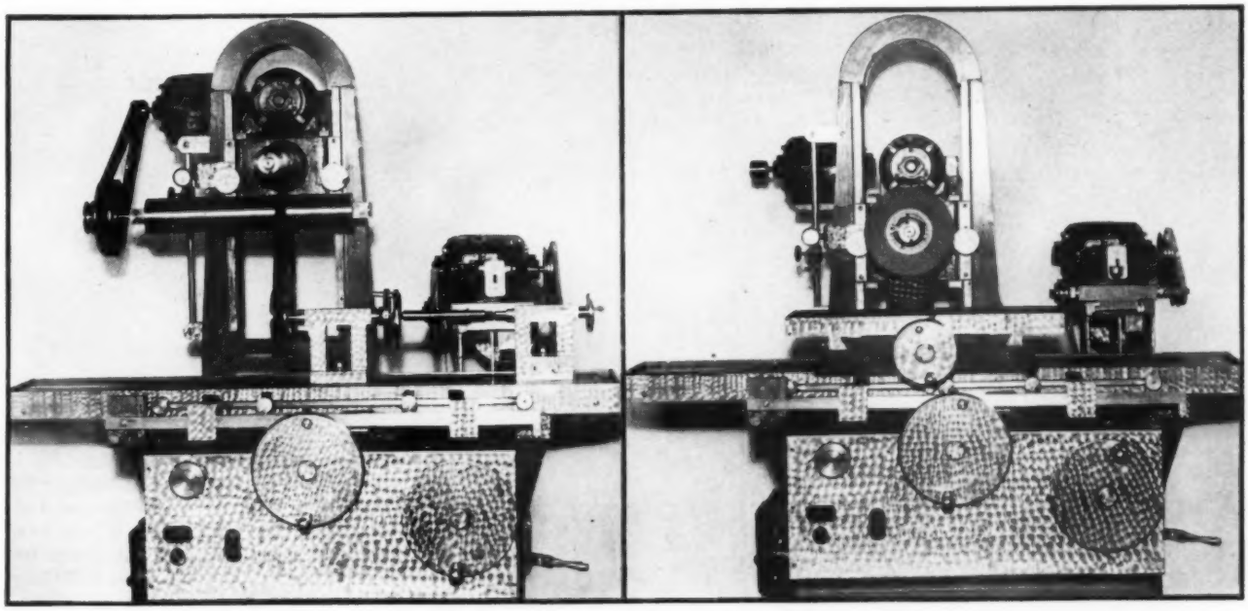


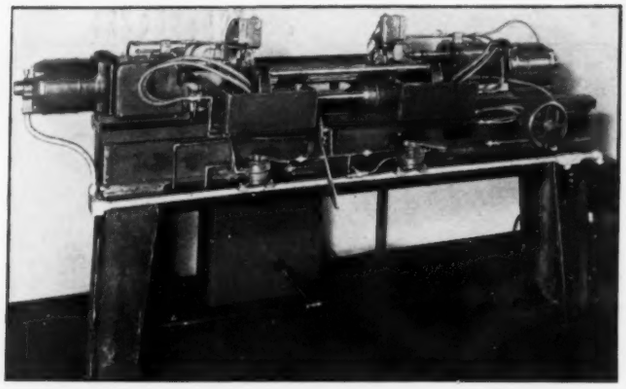
Gun Barrels Spot Ground In Fitchburg Multi-Head Units

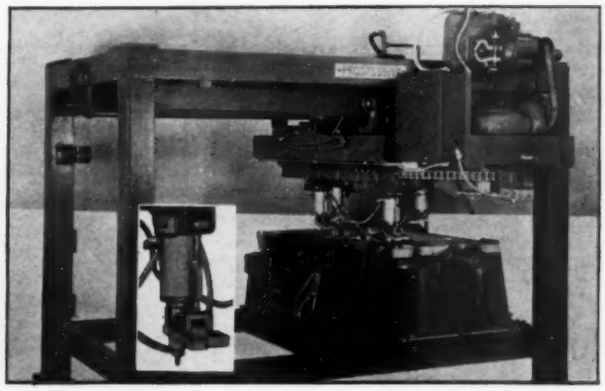
Gun barrels and long spindles requiring back rests in subsequent turning operations are spot ground on double and triple head machines manufactured by Fitchburg Grinding Machine Corp., Fitchburg, Mass. Rough forgings, which have been centered, may be ground directly from the rough. A single push-button controls the cycle of all the heads, although in the case of rough forgings it is sometimes necessary to feed the wheelheads in by hand until contact is made. The Bowgage self-contained automatic units are mounted on the ways so that they can be located longitudinally in all positions. The coordinated control of all dimensions being ground at once reduces danger of spoilage. The Bowgage grinding wheel head units are standard and interchangeable. If the operations for which they are being used are discontinued, the heads can be used elsewhere—either on standard machines or regrouped and remounted.

Granell Precision Surface Grinder Has Automatic Feed

A new automatic-feed precision surface grinder with worm gear drive and mechanical or hand feeds is announced by G. P. Granell & Co., 292 Geary Ave., Toronto, Ont. Capacity of the machine is 34-in. long, 10-in. wide, and 14-in. high, using a 10-in. diameter wheel. Emergency height can be obtained by removing top of the sliding block. The spindle is of chrome-molybdenum steel, ground and lapped, running in a phosphor-bronze front box with adjustment for wear and end-play. The speed is 3,500 r.p.m. The work-table is 68 in. by 12 in., hand-travel 36 in., and automatic travel 34 in. with automatic cross feed of 10 in. The longitudinal table feed is automatic, reversal of table being controlled by adjustable dogs operating against a reversing lever. Manual reversal is accomplished by means of a control lever on the front of the machine. Table may be operated by hand.







Gun Barrel Ends Recentered With W. M. Steele Machine

Recentering both ends of gun barrels after the drilling and rough reaming of the bore is performed with a machine developed by W. M. Steele Co., 98 Beacon St., Worcester, Mass. In the operation, the barrels are placed on loading Y's, and barrel locating plungers enter the bore. The loading arms are then swung against stops, placing barrel with its bore in alignment with the drill spindle. These spindles are mounted at opposite ends of the bed with heads placed in exact alignment in the dovetail machined ways.

Three jaw air chucks lock barrels in position so that locating plungers can be retracted from the bore. After loading arms return to the loading position the automatic drilling cycle begins. At the end of the cycle spindles return, opening the chucks and allowing barrels to roll out on a draining rack at the back of the machine. Production rates of from 1,500 to 2,500 barrels per eight-hour day are obtainable. Three machines are available: one to recenter 16- to 26-in. barrels of 30 cal.; another recenters barrels of 30 cal., with lengths from 24 to 36 in.; and the third recenters 50-cal. barrels from 36 to 46 in. long.

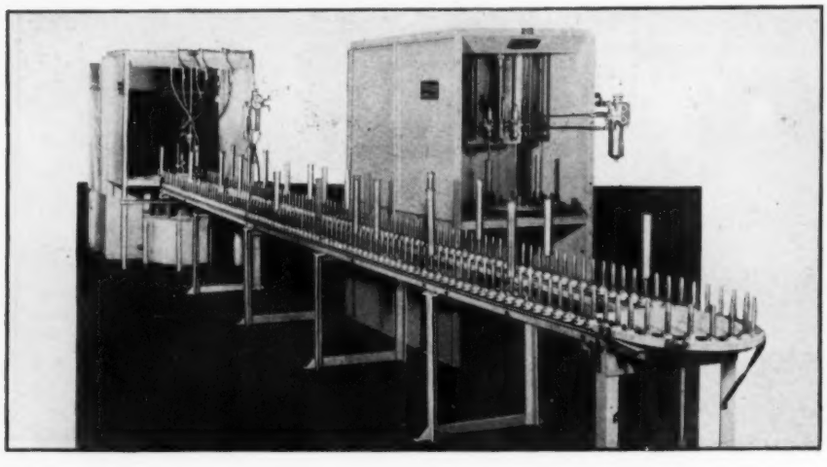
Progressive Welds on Stationary Work by New Progressive Welder

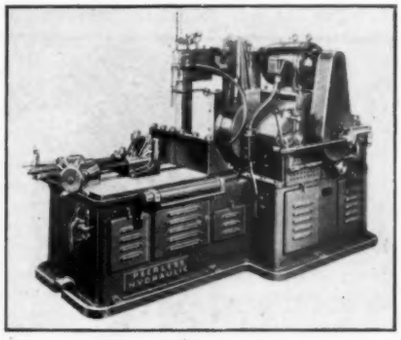
Knee-action, walking welding guns, developed by Progressive Welder Co., 3001 E. Outer Drive, Detroit, Mich., permit multiple welds to be performed in sequence in an automatic machine where it is preferable to hold the work stationary in large fixtures. Welding guns are moved by a continuous chain. Weld is controlled by an electric timer. As each weld is completed, pressure is taken off the gun points, and these points swing under spring pressure to a new position farther along, depending on the amount the chain has moved.

Special Machine Made by DeVilbiss To Finish Incendiary Bomb Components

A two- and three-station machine for painting exterior and interior surfaces of the component parts of a 4-lb. incendiary bomb has been developed by the DeVilbiss Company, Toledo, Ohio. The bomb consists of two parts—a cylindrical tube which contains the charge and a tall, hexagonal tail assembly which contains the detonating mechanism. The charge container is coated on the inside with acid-resisting black paint and on the outside with zinc chromate primer. The mechanism casing is coated inside and out with the primer only. The machine consists of a fully automatic spray station for exterior painting, one or two semi-automatic spray stations for interior painting, and a chain-on-edge spindle-type conveyor.

After the cases are placed on the workholders of this machine they move into the first spray station where, as they are rotated, their exterior surfaces are automatically painted. Then, without stopping, they pass over a section of the conveyor which is long enough to provide a five-minute drying period. When they reach the unloading station they are removed from the workholders, two at a time, and placed on the stands in the semi-automatic spray stations. Here moving extension guns automatically coat the interiors. Production rate of 2,000 pieces per hour is maintained when the machine has a conveyor length of 25 ft., and is provided with two semi-automatic spray stations for interior painting. Elimination of one of the latter cuts production rate in half.





Peerless Vertical Cutting Power Saw Can Handle Large Work

Extension of the work table to 35 in. permits the handling of large work on the vertical cutting power saw announced by the Peerless Machine Co., Racine, Wis. Work can be lowered and readily removed from the saw by crane. Elevating stock rollers are provided on both sides of the work table to facilitate shifting the work. These rollers,

Special Multiple-Spindle Milling Machine

This special 7-spindle machine was designed by our engineers for the mass production of saddles for Milwaukee Milling Machines . . . a higher degree of accuracy was obtained than by previous methods . . . and production was increased 350 per cent.

KEARNEY & TRECKER CORP., MILWAUKEE, WIS., U. S. A.

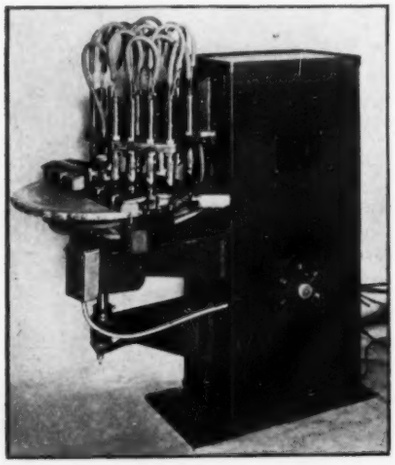
KEARNEY & TRECKER
CORPORATION
Milwaukee
MILLING MACHINES

Milwaukee MILLING MACHINES

as well as the saw-blade feed pressure and the blade lift, are operated hydraulically. Tool steel as long as 24 in. and up to 10 in. in thickness can be cut without turning the work. Capacity with standard vise jaws is 16 × 16 in. Three speeds are available—50, 85 and 125 strokes per min. Each stroke is 6 in. The machine occupies a floor space of 56 × 121 in., and weighs 5,400 lb.

Taylor-Hall Builds Three Types of Bomb Welding Machines

Three bomb welding machines have been designed and built by the Taylor-Hall Welding Corp., Worcester, Mass. A three-spot machine is used for spot-welding the caps to the body wall of incendiary bomb tail assemblies. A six-spot machine welds the end caps into the tail pieces of incendiary bombs.

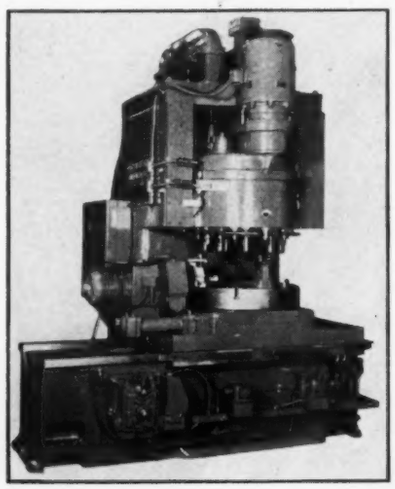


The newest design is a 20-spot machine used to weld bomb tubes. It is equipped with a variable speed drive, using a Boston gear reduction unit, and a Reeves variable speed pulley. Speeds obtainable are from 3 to 5 r.p.m. The operator has no difficulty in keeping up with the maximum speed of the machine. Machine is furnished with complete electronic control.

Davis & Thompson Miller Is Hydraulically Controlled

A hydraulically controlled nine-spindle vertical milling machine is announced by the Davis & Thompson Co., 5619 W. Mitchell St., Milwaukee, Wis. The base of the machine contains the hydraulic drive reservoir and control equipment, as well as the coolant sump and chip clean-out. The table slide has a 44-in. maximum travel, and the circular work table has a reciprocating motion actuated by a self-contained hydraulic unit mounted integral with the table. The reciprocating motion of the work table is adjustable to any length of stroke within the limits of the hydraulic cylinder.

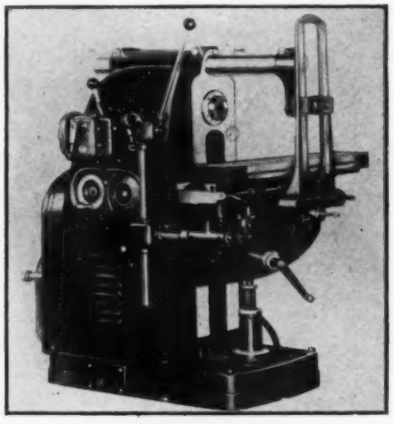
The nine-spindle head is driven by a flange-mounted motor and provision is



made in the head for changing spindle speeds by substituting various gear combinations. All spindles have micrometer adjustments for vertical travel. An oil pump mounted in the spindle head provides positive pressure lubrication of all working parts. The action of the head is controlled by an oil cylinder mounted vertically on the top of the column and is actuated in cycle with the movements of the table slide. All cycle functions are hydraulically controlled through electrical switches and solenoids.

Redesigned Simmons Miller Features Speed Selector

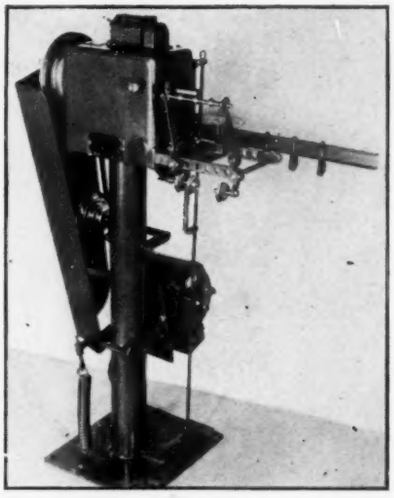
The No. 1A Micro-Speed milling machine, offered by the Simmons Machine Tool Corp., Albany, N. Y., has been redesigned. Among the new features is a selector dial hand wheel on the center column within easy reach of the operator. The motor is built integral with the main drive unit, and through



the variable speed micro-unit an unlimited range of selective speeds is obtainable. Control is through the selector dial wheel. The spindle is made from forged alloy steel, heat-treated and ground to size. All shafts in the head and feed box run on anti-friction bearings. Positive automatic longitudinal power feed is provided.

Globe Uni-Matic Winder Made in Several Types

The Uni-Matic coil winder, produced by the Globe Tool & Engineering Co., 436 Davis Ave., Dayton, Ohio, winds coils for relays, solenoids, transformers inductances and other control coils, either in single or multiple, hand or machine guided. The machine is available in bench or pedestal types, or with bed and tailstock. Duplicate leveling attachments will allow interweaving a cotton cord. Three counters are available: an indicating-dial counter is used for manual control, the electrical



counter stops the machine on a predetermined turn setting, and the gear-stop counter position-stops the spindle for tying or indexing, and at the same time automatically resetting for the next operation.

The winder operates at various speeds from 120 to 600 r.p.m. Higher speeds may be used on certain types of coils. Pressing a pedal releases the brake and then engages the clutch to start the machine. An interlock allows the brake to be released while preventing engagement of the clutch. Capacity of the machine is suitable for copper wire in sizes from No. 16 to No. 42 gage. The No. 1-A series will accommodate coils up to 6 in. in diameter and 6 in. in length, while the No. 2-A will accommodate coils up to 8 in. in diameter and 8 in. long.

Three Multi-Purpose Shapers Offered by General Engineering

A new line of multi-purpose shapers has been announced by the General Engineering & Mfg. Co., 1523 S. 10 St., St. Louis, Mo. These machines are available in sizes ranging from 16- to 24-in. stroke and are offered in three types: plain, production and universal.

The shapers are equipped with a plain table, plus table support, and a wide range feeding mechanism. A safety feature known as "Lubrigard" permits operation of the shaper only in the presence of sufficient lubricating

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Speeds increased 25%...Tool life 60% with SUNICUT

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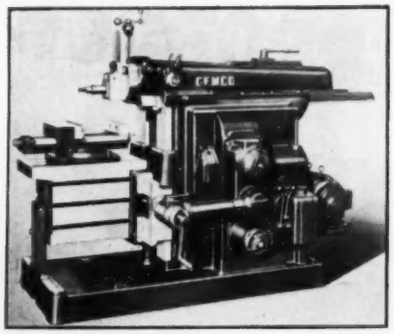


oil. Other features include a powerful ram with extra large sliding surfaces and bearings, built-in and flood lubricated silent gear drive, twin-type bull gear suited to both high-speed and low-speed operation, and a force feed lubricating system employing a circulating pump and an automatic, self-cleaning oil filter.

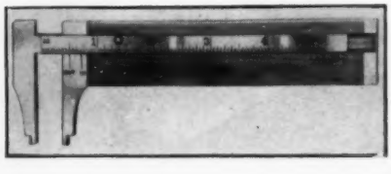
Pope Precision Spindles Have Sealed-In Lubrication

Precision ball and roller-bearing grinder spindles with sealed-in lubrication are announced by the Pope Machinery Corp., 261 River St., Haverhill, Mass. Sealed-in lubrication requires no attention from the operator. Design

is such that no lubrication can get out nor can any dirt get in. Operating temperatures are about 30 F. over room temperature; no time is lost in warming up. SKF tool bearings are used.

Stanley Pocket-Size Rule Has Brass Caliper Slide

A pocket size caliper rule, No. 136½, has been introduced by Stanley Tools, New Britain, Conn. Caliper capacity permits measuring hole diameters from



7-32 to 5 in., widths or lengths up to 5 in., and diameters of rounds up to 3 in. Rule is made of boxwood, with brass caliper slide graduated by 16ths and 32nds to full length. Back of rule has vertical graduations in 16ths for measuring up or down, right or left on straight surfaces.

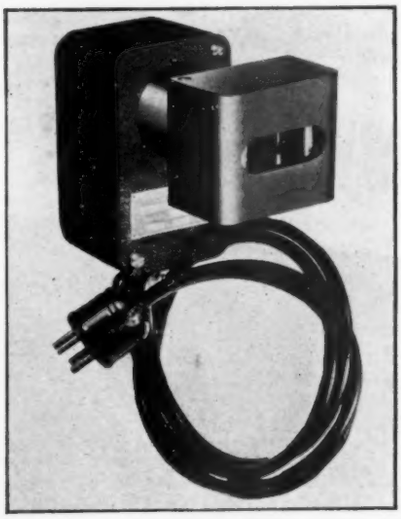
Tampice Fiber Brushes Will Polish or Form Metal Parts

Tampico fiber industrial brushes introduced by the Osborn Manufacturing Co., Cleveland, Ohio, will remove burrs, polish or form metal parts, and finish welded seams. Used with proper abrasives, the brush will remove tool marks from aircraft motor parts, such as con-

necting rods, tappets and cams. Another application is the slight rounding of corners of different motor parts, gear teeth and similar products. When used without abrasives, the brush will remove burrs without damage from metals such as aluminum and Alclad. Brushes are available in diameters of 4, 6, 8, 10, 12, 14, 15, and 16 in.

Cinephone Scanner Made For Photoelectric Set-Ups

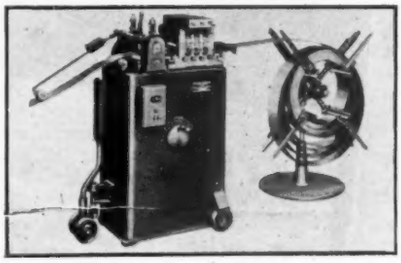
For use wherever photoelectric control is desired from a reflecting surface at a distance of two inches or less, a scanner developed by the United Cinephone Corporation, Torrington, Conn., consists of a light source and two phototubes in a compact housing, ready for attachment to any sensitive photoelectric amplifying system. In operation, light from the bulb mounted in metal housing passes through the double converging lens in the barrel, hen through the aperture, concentrating a spot of light on the surface being scanned. This is reflected back into the phototubes, its intensity being dependent upon the reflective quality of the scanned material. Thus a registration mark on the moving paper, or the travel of a meter pointer into the spot of light concentration will cause a



change in the illumination reaching the photo-tubes. The response of the photo-tubes to this change in reflected light intensity is transmitted through co-axial cable to a remote amplifier.

Combination Roll Feeders Made for Press Jobs by Littell

A combination feeding and straightening machine mounted on a fully inclosed fabricated steel base is announced by the F. J. Littell Machine Co., 4169 Ravenswood Ave., Chicago, Ill. The unit is arranged so that either five or seven straightener rolls may be used. Control arm on the feed unit stops and starts the motor to maintain the correct loop of stock between feed and the press. Pinch rolls



are 3½ in. in diameter by 8½ in. long for handling stock up to 8 in. wide. Standard feeding speeds are 10 to 60 ft. per min. Unit is driven by a ¾ hp., 1725 r.p.m., 60 cycle, 220 or 440 volt motor. Floor space required is 17 × 36 in. The machine is shown equipped with an automatic centering reel.

Electric Networks Interconnected Easily With Burndy Connector

An insulated connector designed for use in conjunction or limiter boxes of industrial secondary networks is announced by Burndy Engineering Co., Inc., 107 Eastern Blvd., New York, N. Y. The connector, a special mole, equipped with molimiters provides a simple and compact means of interconnecting the

AT MONARCH
we work
under these flags
for VICTORY

BEHIND NEW MEN AND OLD . .

THE SPIRIT OF THE *Phantom Gear*

THE FIRST LESSON taught to new men at Monarch emphasizes that we tolerate no letdown in quality, regardless of production pressure. This seldom needs repetition, because many of these newcomers are "old-timers" in machine shops, accustomed to accuracy and fine workmanship such as we insist on.

From foremen and fellow workers, our new men quickly gain the inspiration of "*The Phantom Gear*," that spirit of Monarch which for years has stimulated the building of better and more useful lathes. Now, "*The Phantom Gear*" has joined our country's services, and stands behind new men and old, encouraging them to give their utmost in the race to produce the implements of VICTORY.

* * *

You who use Monarch lathes today can depend upon these men not letting you down. They know the overwhelming importance of dependable tools to build planes and ships and tanks and guns. Old-timers and newcomers alike work with hands and heads *and hearts* so that the home forces will keep well equipped their sons and their grandsons who are on the firing line.

THE MONARCH MACHINE TOOL COMPANY • • • SIDNEY • OHIO

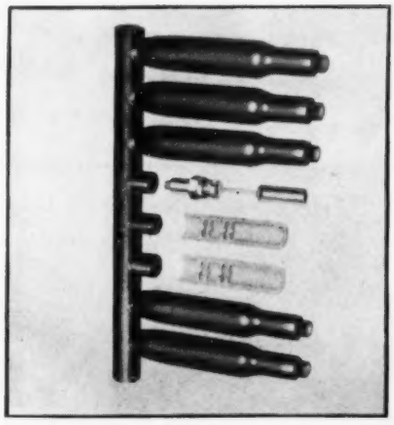
ACCURATE AS ALWAYS

Even with vastly increased production, Monarch lathes continue to hold their reputation for unfailing accuracy.

Two reasons account for this. First, accuracy is a fundamental of Monarch design. Second, Monarch men are trained in quality production, and the maintaining of accuracy in their work is a standard, routine, everyday requirement.

MONARCH LATHES

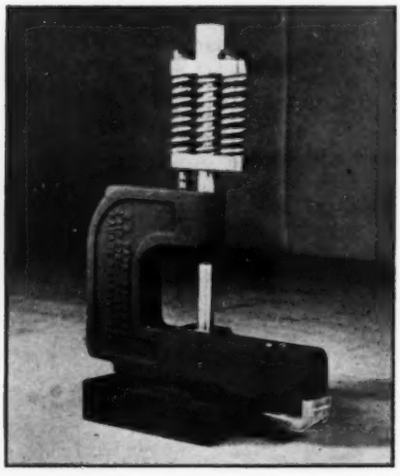
COVER THE TURNING FIELD



ties of the network, joining the ties to the network transformers. and tapping off any number of loads. A central conducting body is surrounded by a molded insulating jacket and contains any number of cable outlets. Each outlet has a molimiter—an easily installed fusible element—which quickly isolates faulty ties or faults in any of the joining cables.

Strippit Punch, Die Holders Require Short Time to Set

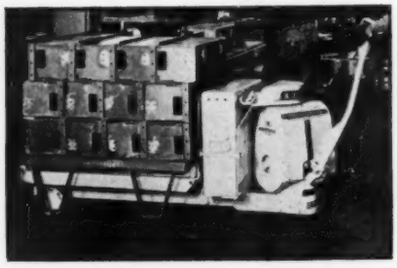
Punch and die holders which punch $\frac{3}{16}$-in. holes on a center-to-center distance of $\frac{5}{8}$ in. are announced by the Strippit Corporation, 1200 Niagara St.,



Buffalo, N. Y. Nothing is attached to the ram of the punch, and each unit may be reset or removed from the rail quickly. Punches, dies and springs may be removed from holder instantly. Only a few minutes are required for each die setting.

Automatic "Transporter" Truck Features Front-Wheel Drive

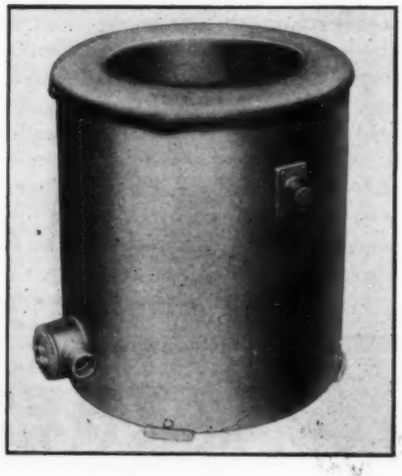
The "Transporter" lift truck, introduced by Automatic Transportation Co., 113 W. 87th St., Chicago, Ill., combines a foot-operated hydraulic lift platform system with electric power front wheel drive. It will handle loads up to 6,000 lb. Hydraulic pump is foot operated, combining easy foot pressure with minimum number of strokes for 3½ in. lift. Release lever provides controlled, shockproof lowering of platform. Roller chain drive connects with a heavy-duty industrial truck motor. Contactor control with forward and reverse speed push button is built into steering handle grip for control. There are two speeds forward and reverse, which are



obtained by lowering or raising steering handle at position below break release position. Brakes are applied when steering handle is in the upright position. The single front drive wheel fitted on turntable has a tubular steering handle and grip. Steering with full power is possible at any angle through 210 deg.

Wiegand Melting Pots Hold 10 to 920 Lb. of Solder, Lead

Type P Chromalox melting pots for solder, lead, babbitt and tin, rated from 250 to 9,000 watts for operation on 115, 230 and 460 volts, single phase a.c., are offered by Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh, Pa. Pots are available with melting capacities from 10 to 920 lb. Smaller size melting pots, rated at 500 to 1,380 watts, are heated by Chromalox ring units clamped to the crucible bottom within the insulated jacket. They are wired for single or three heat operation. Larger pots incorporate strip heaters clamped to the crucible inside the insulated jacket. These provide maximum safe temperatures of 900 F. Automatic temperature control is necessary for this unit.

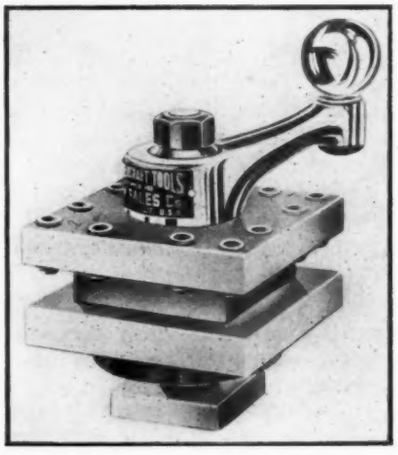


Ajax-Northrup Brazing Unit Joins Bomb and Shell Parts

A special unit for brazing bomb bodies has been developed at the Ajax Electrothermic Corp., Trenton, N. J. After the surfaces are prepared, a ring of compound is placed in position, the assembly heated by placing it inside the induction ring, and the parts are brazed. There is no residue to clean up. The heat is localized and produces a uniform joint in about one-third the time required for welding.

For larger quantity production, small high-frequency generators are used. For example, a 50-kw. high-frequency generator with inductors and controls

will braze 2-lb. bombs or will braze the adapters on 155 or 105 mm. chemical shells. The equipment can be converted after the war to other forms of brazing.

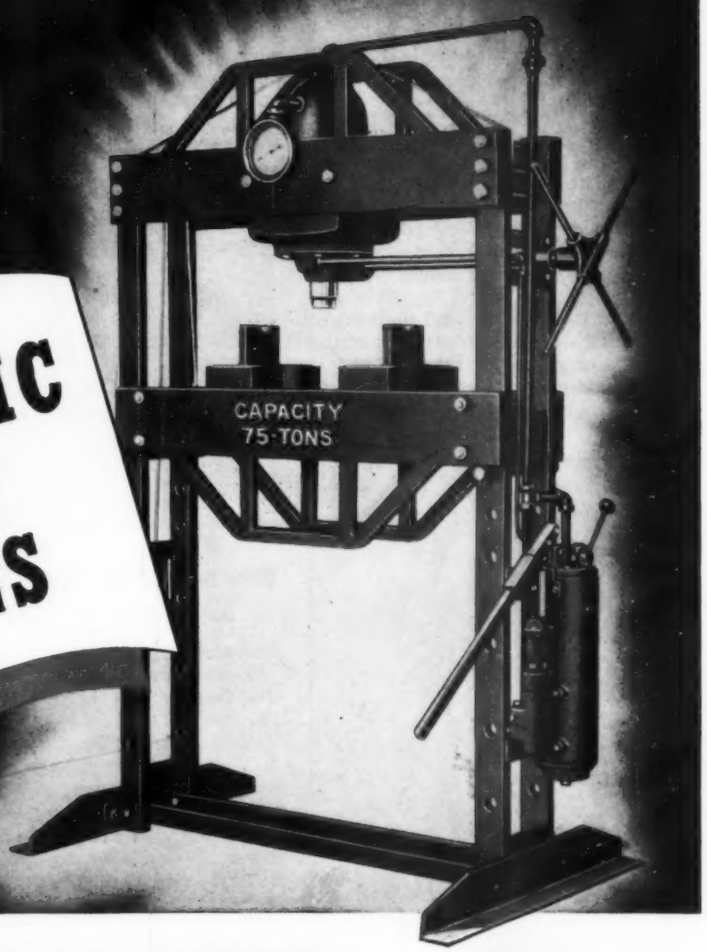


Difficult Tool Set-Ups Saved With F. & M. Turret Tool Post

Tool blocks used on the Mastercraft turret tool post, announced by F. & M. Sales Co., Hollywood, Calif., can be set aside for future use while another tool block is being used on the post. Difficult tool set-ups thus are preserved for subsequent runs at great savings in

KRW

HYDRAULIC ARBOR PRESSES



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Every KRW feature contributes to SPEED—Speed in getting the ram to the work—Speed in developing required tonnage pressure—Speed in raising the ram to remove the work.

Send for your copy of the new 16 page bulletin describing in detail the NEW 2 Speed Pump—The Lever Controlled Valve that opens or closes with a flip of the Ball Arm—and many other patented features found only on KRW Presses.

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Please send Hydraulic Arbor Press Bulletin No. 38.

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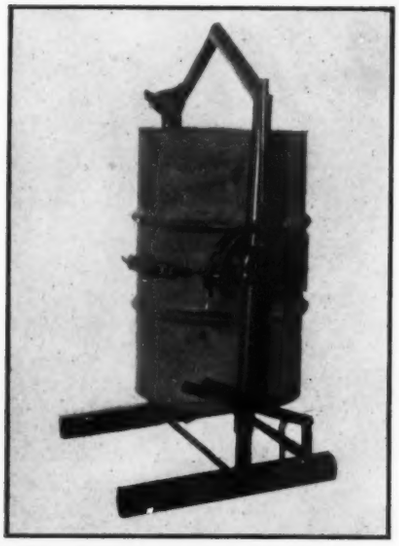
set-up time. The four-way turret tool post has been designed especially for use on the 10-in. South Bend and the 9-in. Workshop lathe. It may also be used on small screw machines. Socket screws have been substituted in place of standard set screws. Four precision steel balls are employed in the block to insure accurate indexing in all four positions.

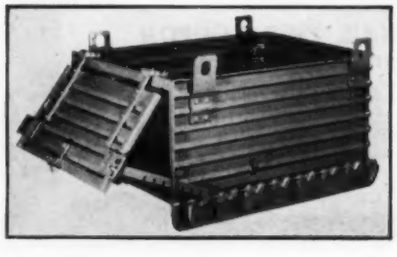
Western Stand Lifts, Rotates, Tilts All Types of Barrels, Drums

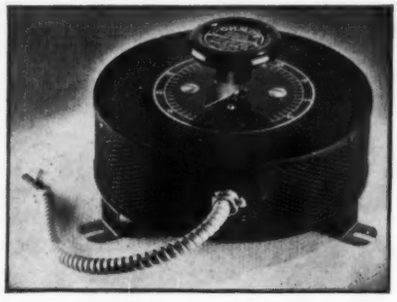
A barrel stand which lifts, rotates and tilts all types of barrels or drums is manufactured by the Western Machine Works, Bruni, Tex. Stand is adjustable to fit all diameters and lengths of barrels. To mount a barrel in the stand, the barrel is placed on end in front of stand. Latch lever is released, allowing upright member of the stand to fall forward and down until the band is in position to be cinched around the barrel. Upright member is then pushed backward and upward carrying the full barrel with it. Locked in a vertical position the barrel is clear of all obstructions and free to be tilted or rotated by the lever.



Truscon Corrugated Box Unit Has Hinged End for Emptying

For efficiently handling small forgings, hot or cold, and other small metal parts, the Pressed Steel Division, Truscon Steel Co., Cleveland, Ohio, has developed a corrugated steel box and platform unit with hinged end door. The bottom of the box is smooth and is made of heavy gage steel, so that when it is placed on a rack and tilted approximately 20 deg., parts will flow easily through the door opening onto a table or other place convenient for the worker. The door is equipped with heavy-duty forged hinges, reinforced and riveted in place. A slotted bar on the side of the door makes it possible to hold the door open as little or as much as desired. The unit may be used with forked trucks and may be equipped with tiering or crane lugs for efficient storage and handling.



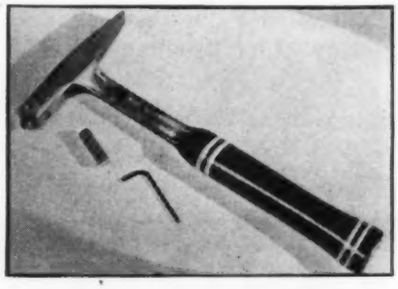


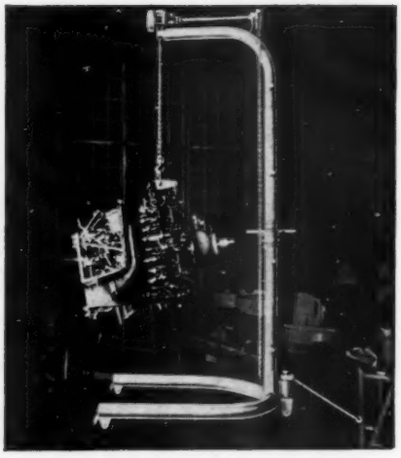
Ohmite Cage Inclosures Guard Rheostats Against Damage

Rheostat cage inclosures for table top or surface mounting are available from the Ohmite Mfg. Co., Dept. 5A, 4835 Flournoy St., Chicago, Ill. Cage protects rheostat from mechanical injury and also prevents human contact with electrically "live" parts. Inclosures are suitable for use with fractional hp. motor controls, heating device controls. Types are available for applications requiring protection against dust, explosion or liquids.

"All-Steel" Inspectors Hammer Permits Changing Stamps

An inspector's hammer in which stamps can be interchanged is offered by New Method Steel Stamps, Inc., 145 Jos. Campau St., Detroit, Mich. The hammer weighs 1-lb. and is designed with a shank forged integrally with the head and extending through the handle, which is of compressed rawhide. Head is drilled for round stamps, ranging from ⅛ to ⅜ in. diameter. Stamp is held in place by a standard size flush-type setscrew.



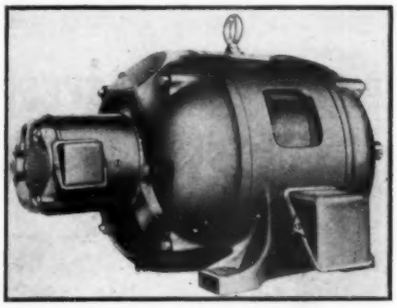


Whiting Aviation Hoists Used In Other Industrial Plants

Originally designed for the aviation industry, the Aero hoist, announced by the Whiting Corp., Harvey, Ill., is applicable to many general manufacturing operations. The hoist which comes in one- and two-ton sizes has a single upright mast equipped with riser steps and adjustable platform. A chain hoist raises and lowers the work or supports it at any desired height. An extension arm keeps the hand chain safely away from the load. Hoist is locked in position by a brake.

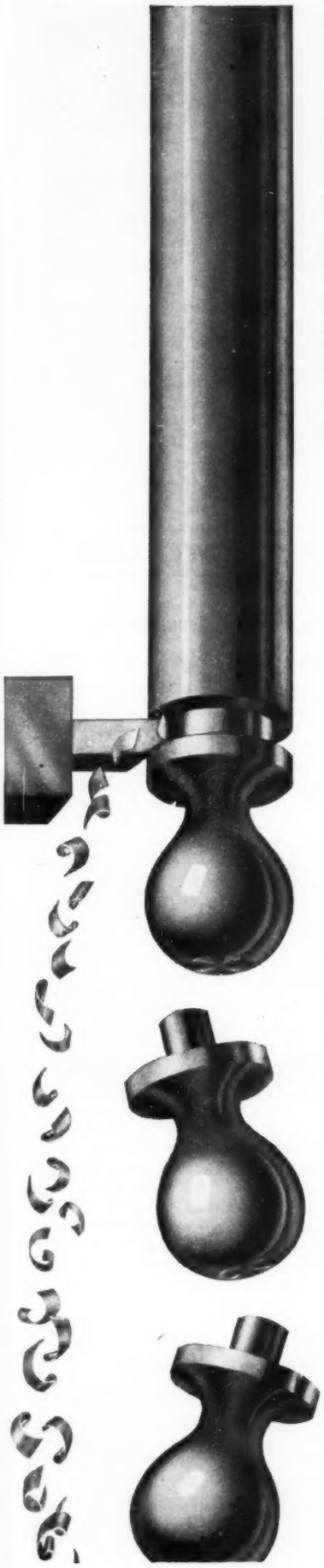
Century Electric Offers A.C. 7½ to 75 Kva. Generators

Revolving field A.C. generators, in sizes from 7½ to 75 kva.; 4, 6 or 8 pole; 1,800, 1,200 or 900 r.p.m., 60 cycle, for belt or coupling drive, are offered by the Century Electric Co., 1806 Pine St., St. Louis, Mo. These generators are wound for the various standard voltages—single phase, two and three-wire; three phase, three and four wire, or two phase, four wire. An automatic voltage regulator is generally used where the load fluctuates through a wide range.



Wabash Bulb Gives Safe Light For Use During Blackouts

Downlighting in a soft beam of blue light that is safe for indoor visibility during blackout is provided by the blackout bulb announced by the



J&L STEEL

COLD FINISHED
BESSEMER
SCREW STOCK

uniform Bessemer Flame Control

free cutting steel for superior parts.

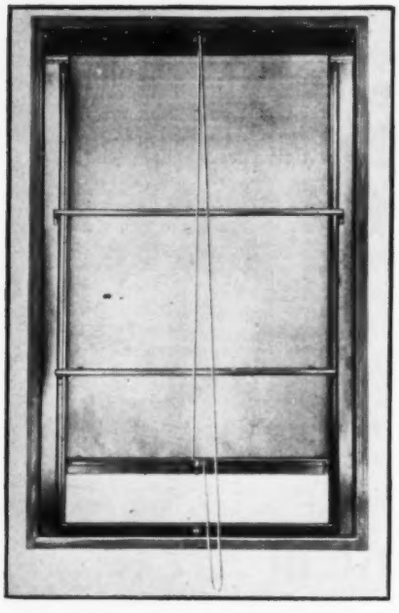
JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS • PITTSBURGH, PA.

Wabash Appliance Corp., 235 Carroll St., Brooklyn, N. Y. The bulb has a silver reflector lining inside that hides all filament glare and projects the light down. Light leaks are prevented by applying silicate coatings that cover the bulb up to the extreme lighting end which is a deep blue.

Metal Braces on Blackout Shades By Higgin Hold Cloth in Guides

Blackout shades have been introduced by Higgin Products, Inc., Newport, Kentucky. Each shade is custom built for a specified opening. Shades are made of special pebble-grain cloth built up



to two layers of fabric and are coated on both sides. Cloth is crackproof and pliable under all climatic conditions. Light metal braces prevent wind pressure from forcing cloth out of metal side guides. A bronze spring catch holds shade in down position.

Edroy Products Eye Shade Includes Magnifying Lenses

Stereoscopic five power magnifying lenses have been incorporated in the Magni-Focuser eye shade developed by Edroy Products, 480 Lexington Ave., New York, N. Y. By a slight tilt of the head, the operator may look through the magnifying lenses at the object be-

ing inspected. When not using the lenses, wearer can readily look beneath the shade. The shade is made of plastic and is strong enough to protect the wearer from flying steel parts or shavings.

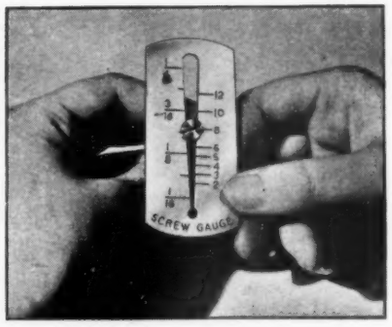
Weight of Tulca Safety Lenses Only Half That of Glass

Rimless safety spectacles equipped with Tulca lenses (not glass) made by Tulca Div., The Univis Lens Co., Dayton, Ohio, weigh only one-half as much as glass safety goggles. Side shields are removable.

American Standard Screw Gage

A handy American National Standard Screw Gage for calibrating both wood and machine screws is offered for free distribution by the Dayton Rogers Manufacturing Company, 2830 Thirteenth Avenue, South, Minneapolis, Minn.

The gages are made from 0.165-in. thick flat steel carefully die cut to size and finished to prevent rusting. An angular slot into which the screws drop indicate their size. The over-all gage

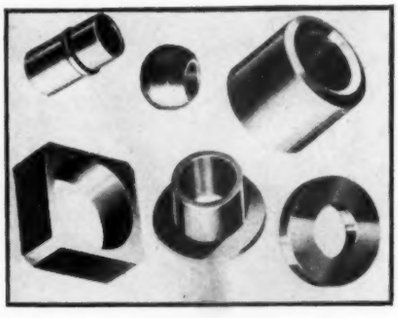


is approximately 3-in. long by 1⅜-in. wide. This gage has two sets of graduations. The one on the right of the angular slot indicates the number or size of wood and machine screws in sizes 2 to 12, while the graduations on the left indicate the diameter size of round stock from $\frac{1}{16}$ in. to ¼ in. The gage is graduated in $\frac{1}{32}$ in., but a $\frac{1}{64}$ in. graduation is easily estimated.

NEW MATERIALS

Keystone Porous Iron Bearings Replace Bronze, Conserving Copper

Porous iron bearings which are stronger than, and interchangeable with porous bronze bearings in most applications have been introduced by the Keystone Carbon Co., Inc., 1935 State St., St. Marys, Pa. Introduced to conserve copper, they are made from powdered



iron which is molded to size in the shape desired, then baked and finally saturated with a good grade oil. They have an average porosity from 25 to 35 percent, enabling them to store a large amount of oil which forms a protective continuous oil film on the bearing surface. In many instances, this oil reserve lasts the entire life of the bearing application.

Protecto-Metal Compound Shields the Welding Arc

George W. Smith & Sons Co., 79 Sterling Ave., Dayton, Ohio, have improved Protecto-Metal Compound No. 2, so that it not only prevents adhesion of weld spatter to metallic surfaces, but removes oxide and impurities from the weld itself, thereby increasing tensile

strength and producing a neater, tighter weld. This compound shields the arc. Because it is an excellent conductor of electricity, it enables deeper penetration of the weld, and tends to prevent the arc from breaking. It is applied by brushing down the seam to be welded, and on the surrounding surfaces where spatter usually collects. After welding surfaces are merely wiped off with a damp cloth.

Bakelite Phenolic Resin Has High Impact Resistance

The Bakelite Corp., 30 E. 42nd St., New York, N. Y., has developed phenolic resin XM-1500, a high impact-resisting molding material that can be preformed on automatic tabletting machines. When molded, this material has approximately twice the shock resistance of general-purpose phenolics. It is water resistant. Specific gravity is 1.36 and the tensile strength, 5,000 to 5,800 lb. per sq. in. The modulus of elasticity is 10-13 x 105 lb. per sq.in. This plastic material is recommended for use where molded parts are to be subjected to temperatures not above 300 F.

W. H. Long Announces Adhesive For Resurfacing Polishing Wheels

A low-cost adhesive called "Stikum" for resurfacing polishing wheels, has been introduced by W. H. Long Co., 425 N. Clark St., Chicago, Ill. The compound penetrates deeply and provides a strong bond. It comes ready for use and dries rapidly. Three grades are available for coarse, medium and fine grains. Wheels are first cleaned and given a primer coat. When this has dried Stikum is applied evenly and the wheel rolled in grain. The application will dry in air overnight or in ovens at 120 F. for two hours. Final coat is applied in a similar manner with the same drying time afterwards.

Roxalin Coating Makes Safety From Ordinary Window Glass

A clear transparent liquid coating that transforms ordinary glass into safety glass and prevents broken glass from flying has been developed by Roxalin Flexible Finishes, Inc., Elizabeth, N. J. While the coating is not claimed to stop glass from fracturing, it keeps broken glass in place, thus preventing

CUTTING OIL SERVICE THAT COUNTS

Stuart's Thred Kut for tapping

Stuart's SOLVOL LIQUID CUTTING COMPOUND for turning

Stuart's "SUPER-KOOL" BASE for cold nosing

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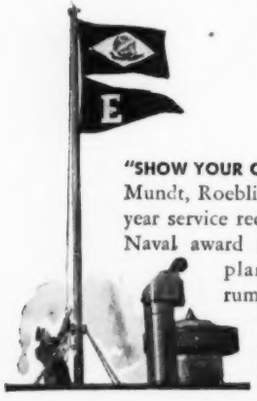
To the Pacemaker in Wire
A NAVY "E"!

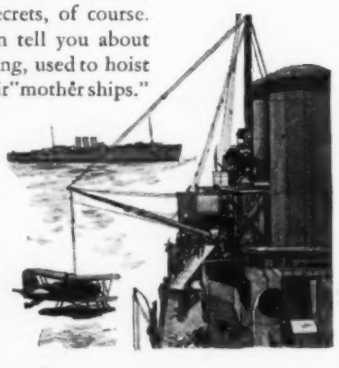
7000 VOICES SPOKE in the person of William A. Anderson, president of Roebling, who received the flag of the Bureau of Ordnance and Navy "E" Pennant on behalf of more than 7000 Roebling employees January 22, 1942. The reward was made for excellence in production for the war effort.

AN ENEMY BOMB fragment is swallowed by the Roebling open hearth furnaces, from the hand of a Naval officer . . . to be made into steel for the Navy, and returned with interest to those who menace American liberty.

FOR PULLING TOGETHER, doing the job the American way, every Roebling employee received an "E" button. In the group at right six employees with a combined service record of 256 years receive the "E" from a Naval officer.



WIRE GOES TO SEA in hundreds of forms, many of them Naval secrets, of course. But among those we can tell you about is this stout wire rope sling, used to hoist seaplanes back aboard their "mother ships."



"SHOW YOUR COLORS!" Proudly, John C. Mundt, Roebling employee with a 50-year service record, breaks out the two Naval award flags over the Roebling plants. Beneath him, the rumble of machinery continues unbroken, producing for American defense at breakneck speed.

JR ROEBLING

ROEBLING

The Pacemaker in Wire Products

JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY • Branches and Warehouses in Principal Cities

dangerous glass splinters from flying. It may be applied by brushing on the interior of clean glass. Roxaneal coating is available also in blackout type. The blackout type can be removed by peeling with a razor blade or washing with solvents. It enables war plants to make safety glass out of ordinary glass windows. Experience in London has shown that flying glass is one of air raids greatest hazards. Explosion and other breakage tests have shown that coated glass will not fly.

TRADE PUBLICATIONS

CONVEYORS Gravity wheel and power belt conveyor units are discussed in a 4-page folder put out by Metzgar Co., Grand Rapids, Mich.

FURNACES Convection type, recirculating stress relief and air draw furnaces are described and illustrated in a 4-page equipment bulletin, No. 650, published by Mahr Mfg. Co., Minneapolis, Minn.

GAGES Manning, Maxwell & Moore, Inc., Bridgeport, Conn., has released the 1942 Ashcroft gage catalog.

HAND CARE The care and cleaning of hands and arms in industrial plants is discussed in technical bulletin No. 51 released by Magnus Chemical Co., Garwood, N. J.

INDUSTRIAL CLEANING—L & R Mfg. Co., 54–56 Clinton St., Newark, N. J. have issued a booklet of information about industrial cleaning machines and solutions.

INFLATION "How to Check Inflation" is the title of pamphlet No. 64 just released by Public Affairs Committee, Inc., 30 Rockefeller Plaza, New York, N. Y. Prepared by Professor John Clark of Columbia University, this pamphlet defines inflation, discusses its causes, and makes some practical suggestions on how to attack the problem through a coordinated program. Price, 10 cents per copy.

LEATHER PACKINGS Leather packings for hydraulic or pneumatic equipment are described in a folder put out by J. E. Rhoads & Sons, 35 N. 6th St., Philadelphia, Pa.

PLATFORM TRUCKS Bulletin No. 1261 offered by the Atlas Car & Mfg. Co., 1100 Ivanhoe Rd., Cleveland, describes platform trucks of 2- and 3-ton capacities.

SHOP TRUCK A ½-ton shop truck is described in Bulletin No. 1096 published by The Buda Co., Harvey, Ill.

STAINLESS DATA A data sheet on the characteristics of Rezistal stainless steels has been prepared by the Cruci-

ble Steel Company of America, 405 Lexington Ave., New York, N. Y.

V-BELTS Cable-Core V-belts are described in folder offered by the Medar Company, 3500 De Kalb St., St. Louis, Mo.

WELDING The General Electric Company, Schenectady, N. Y., has put out publication GES-2704, entitled "Reducing Welding Costs With A-C Welding."

NEW BOOKS

WORK ROUTING, SCHEDULING, DISPATCHING AND PRODUCTION—*By John Younger, professor of industrial engineering, The Ohio State University, and Joseph Geschelin, Detroit editor, Automotive Industries.* 160 *pages. Published by the Ronald Press Company,* 15 *E.* 26 *St., New York.* $3.25.

Few people outside of industry realize the part played by planning in efficient production. They are likely to think in terms of men, machines and materials, without taking account of the vital role played by management in its various functions. It is safe to say that percentagewise, work routing, scheduling and dispatching have greater influence on plant output than any other factors.

In this book the authors present clearly the individual considerations that underlie these functions. They describe, for instance, such essential details as the analysis of operations, the use of fixtures, economic lot sizes, standardization, the use of charts, material handling and other highly essential considerations needed to make work flow smoothly through the shop.

The text is accompanied by a series of problems so it may be used in teaching the subject. The volume will serve as well as a guide for the many young men that have been called by industry to help solve one of its most pressing problems.

•

AIRCRAFT HANDBOOK: FIFTH EDITION—*By Fred H. Colvin, editor emeritus, American Machinist.* 784 *pages. Published by the McGraw-Hill Book Company,* 330 *W.* 42 *St., New York.* $5.00.

Aircraft design changes so rapidly nowadays that books on the subject need frequent revision to keep pace. The first edition of the "Aircraft Handbook" was written in 1917 as an aid in maintaining planes used by the Army and Navy air forces. It is a far cry from the "crate" of the first World War to today's efficient fighting machine.

The current edition follows the technique used previously in taking up successively various aircraft elements, beginning with the engine. In fact, a good 50 percent of the book is devoted

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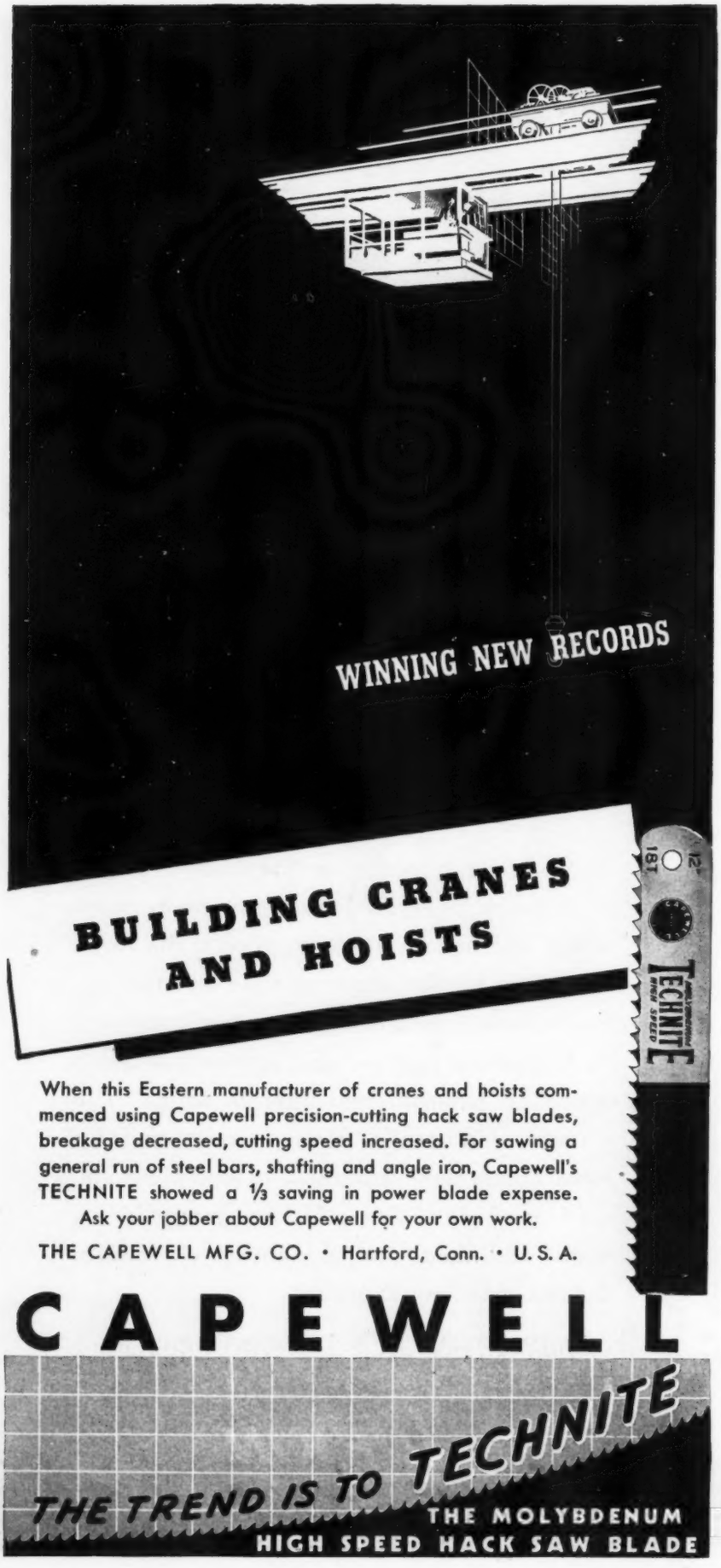
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When this Eastern manufacturer of cranes and hoists commenced using Capewell precision-cutting hack saw blades, breakage decreased, cutting speed increased. For sawing a general run of steel bars, shafting and angle iron, Capewell's TECHNITE showed a ⅓ saving in power blade expense.
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THE TREND IS TO TECHNITE
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to this most important unit in aircraft. Following the discussion of engines, which includes component parts such as carburetors, magnetos and starters, the volume describes other major aircraft units such as propellers, landing gear and instruments. A chapter is devoted to S.A.E. aircraft standards.

•

BLUEPRINT READING—*By Arthur A. Dick, chairman, Industrial Arts Dept., Sparrows Point High School, Baltimore County, Md.* 157 *pages. Published by The Ronald Press Company,* 15 *E.* 26 *St., New York.* $2.40.

Books on blueprint reading are popular today because of the necessity of initiating a large number of newcomers into the mysteries of shop language. It has been found that even industrial workers with considerable service in the shop are surprisingly ignorant of a working knowledge of this subject. This volume is printed in blue ink which lends itself to the use of positive cuts which simulate blueprints in appearance.

Mr. Dick's book consists of two parts: the first devoted to information, and the second to a series of problems and assignments. The reader is first given the conventions used in mechanical drawing in the way of abbreviations, terminology, symbols, methods of notation and dimensioning. He is also given a series of sketches, both in perspective and projection to develop his powers of visualization.

The problem section of the book offers a number of specific cases that may be used to apply the information given in Part 1 in much the same way that it would be used in the drawing room or shop.

•

PRODUCTION CONTROL—*By Lawrence L. Bethel, director, New Haven Y. M. C. A. Junior College, Walter L. Tann, planning and control engineer, Birmingham Company, Franklin S. Atwater, production engineer, Fafnir Bearing Company, and Edward E. Rund, production control manager, U. S. Rubber Company,* 276 *pages. Published by the McGraw-Hill Book Company,* 330 *W.* 42 *St., New York.* $2.75. *Teachers Manual,* 10 *cents.*

The urgent need of today is that we get there with enough materials and on time. That means that factory production must be carefully scheduled and more important still, that these schedules be met. Any book that will tell how to do this efficiently is certainly timely and constructive.

The volume under discussion has the merit of four diverse viewpoints which represent a survey by the authors of Connecticut industries. In gathering material, they visited 60 representative companies and conducted group conferences attended by representatives from 185 companies.

The presentation is based on state-

ment of basic principles of production control illustrated by case histories and accompanied by case problems. A few of the topics dealt with are production forecasting, budgeting, planning, procurement of materials, scheduling, quality control, records and follow-up.

While the book is designed primarily for the use of classes in the management defense training program, it should be equally useful to those production men whose responsibility it is to see that schedules are met.

•

PILOTS' AND MECHANICS' AIRCRAFT INSTRUCTION MANUAL—*By G. C. DeBaud, flight lieutenant, Royal Canadian Air Force.* 490 *pages. Published by The Ronald Press Company,* 15 *E.* 26 *St., New York.* $4.50.

Instruments are the "brain" of modern aircraft, for upon their readings the pilot depends for his safety and for the effective operation of his plane. It is essential, therefor, for those who fly and for those who service ships of the air, both fighting and commercial, to have a full understanding of these instruments.

Lieut. DeBaud has avoided highly technical discussions that would be of interest only to a specialist in a particular field. Instead he has used a more interesting and popular approach designed to be of maximum value to the student flyer or service man. This volume should be useful in preparing young men for pilot rating tests or for a mechanic's license.

Aviation instruments today are of such variety that it takes considerable space to list them, let alone describe them. But it is the cause of this wide variety that the subject needs study and the attainment of a good working knowledge by those who are working in this field.

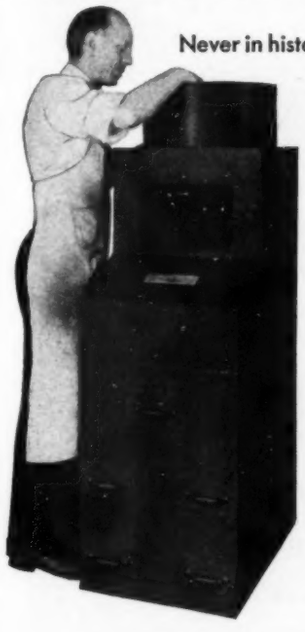
•

WAGE INCENTIVE METHODS: Second Edition—*By Charles Walter Lytle, associate professor of industrial engineering, New York University.* 462 *pages. Published by the Ronald Press Company,* 15 *E.* 26 *St., New York.* $6.00.

This revised edition of a well-known volume constitutes one of the most thorough analyses of wage incentive methods available. As in the original book, the treatment of various plans is standardized to make them all comparable at sight. This has made it possible for the author to point out strong and weak characteristics of the different plans; impartial criticism of each plan makes this book particularly valuable to the plant manager and the industrial engineer.

Labor conditions have changed completely since 1929, when the first edition of this book was published. Nevertheless, the principles and techniques upon which most wage incentive plans are based amount virtually to a scince, and can be discussed as such. Scien-

Locomotives have improved vastly since those ambitious little wood burners struggled across the Union Pacific in the early 70's. The streamliner of today can do far more and do it much faster.



Never in history has progress been made more rapidly in precision gaging than in the last few years. Both standards of accuracy and gaging speed have made spectacular advances. The human equation, such an unpredictable factor just a few years ago, becomes much less troublesome.

Sheffield has its part in this march of gaging progress. It was Sheffield which produced the automatic gage illustrated—also the Electrigage, the Multichek Electrigage, the Precisionaire, the Thread Lead Checking instrument and others. If you are not familiar with what these instruments have accomplished in increased accuracy and faster inspection, write us for the story.

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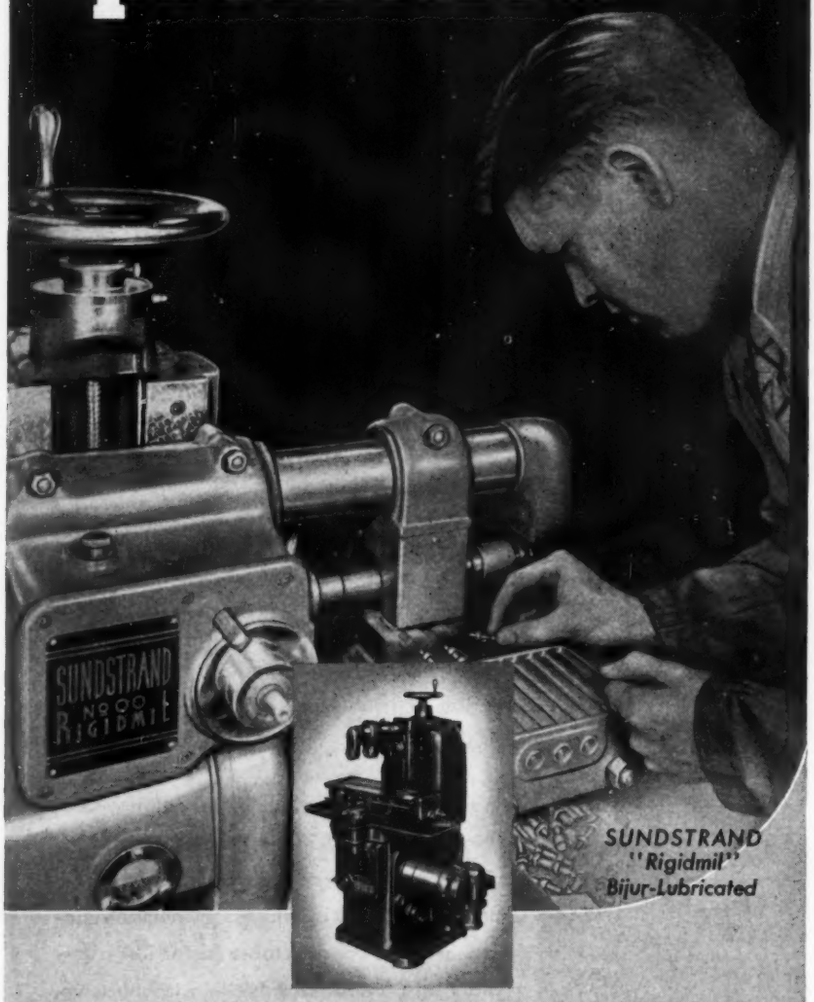

SUNDSTRAND "Rigidmil" Bijur-Lubricated

■ With industry geared to a constantly increasing tempo, high production rates must be maintained over long periods of time. Long runs, multiple shifts, extended hours . . . these and other emergency conditions make efficient lubrication all the more essential. BIJUR automatic "metered" lubricating equipment is doing its part in assuring quality production at top speeds.

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1720

tific principles discussed at some length can be used by executives to intensify time-cost economies and simultaneously to provide the means of meeting the ever-increasing demands of labor. Important improvements have been made in this revision of the book. The text matter has been rearranged, and 60 new charts and tables have been added to the already large number used to illustrate the text.

•

GAGES AND THEIR USES IN INSPECTION—*By Fred H. Colvin, editor emeritus, American Machinist.* 157 *pages. Published by the McGraw-Hill Book Co., 330 W. 42 St., New York.* $1.50.

It is said that rifles were the first products to be manufactured with interchangeable parts. This principle, used today to give speed in assembly, has another advantage when used on ordnance items. Parts from one unit in service can be used as replacement parts on another unit without time-consuming fitting operations that would be impractical in the field.

Interchangeable manufacture depends on the extensive use of gages. As a result, the expansion of our war production has been accompanied by expansion in the use of gages. Mr. Colvin's book on the subject appears, therefore, at a time when a thorough understanding of gages and their use is needed.

The volume discusses gages from their simplest to their most complicated forms. It describes the plug gages, calipers, micrometers and feeler gages used in every shop, to the newer automatic gages depending on electricity or air for their "touch." In addition the volume gives some helpful data on the maintenance of gages.

•

DIE DESIGN AND ESTIMATING: SECOND EDITION—*By Charles Bohmer and George Dannes.* 160 *pages. Published by American Industrial Publishers,* 332 *Fairmount-Cedar Building, Cleveland, Ohio.* $3.00.

This volume, in its new edition, represents the combination of two previously published books. It is especially timely in view of the enormous number of tools that are being made today by outside contractors.

The authors, considering first the subject of design, classify dies in accordance with their basic principles of operation, illustrating each classification with die sets used in practice.

The chapters on estimating discuss every phase of die construction from the machining of the die blocks themselves, to making the accessories and miscellaneous parts. No one knows better than the tool contractor, who has taken work at too low a figure, the need for accurate estimating on work of this kind and the difficulty of securing practical data that will serve as a sound guide.

FOREMANSHIP FUNDAMENTALS—*By A. L. Kress, formerly chief industrial engineer, United States Rubber Company. 276 pages. Published by the McGraw-Hill Book Company, 330 W. 42 St., New York. Price, $2.50*

The foreman has always been a key man, but in times of emergency his importance is emphasized. This volume on foremanship should serve to aid the foreman in making best use of his abilities and to give the higher executive a better understanding of the foreman's job.

A foreman's duties are manifold. He has to see that work gets through his department promptly and on schedule; but, in addition, he must be something of a schoolmaster, bookkeeper, judge and psychologist, all rolled into one.

The author takes up in turn each of the functions of foremanship and suggests how they may be carried out correctly. Training, accident prevention, grievances, planning, quality control, cost keeping and improvement of methods are discussed, to name only a few.

While the foreman's main job is to get results, much of the emphasis in this book is put on the subject of human relations. For foremanship is the first line of management; and if management is to be truly effective the foreman must know his job thoroughly and perform it well.

SEEN and HEARD

By JOHN GODFREY

Stamps Show Welding

The Union of South Africa has recognized the part that arc welding is playing in the war effort by the issuance of a special postage stamp. Stamps of 6d value are printed both in English and Afrikaans, as is the case with all stamps issued in South Africa. The stamp depicts a welder using modern electric arc equipment and dressed in protective head shield, gloves and other protective clothing.

Where Machine Age Counts

There are many places where a machine tool ten or even twenty years old can still give a good account of itself. But where maximum production must be secured age may count as much against a machine tool as it does against a man in the prize ring or on the tennis court. And here is a shining example:

A prime contractor sublet a lot of heavy planing work to a well known shop with planers that were about 20 years old. A short trial made it necessary for him to take the work back in his own shop, not on account of accuracy, but the planing time on the old machines threw his schedule entirely out of kilter. None of these old planers could use carbide tools to advantage

★

AIR CONTROLS
for Today
for Tomorrow

When this thing is over . . . and men and nations are again at peace . . . the Ross air control valves you have installed for efficient defense production will be *equally* dependable for civilian goods production.

Ross valves installed fifteen years ago have been giving years of continuous service and now these same valves are meeting the strenuous demands of defense schedules . . . years of dependable service are engineered into every Ross Valve.

Bring your air control problem to Ross.

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Prime movers

FOR AMERICAN WAR PRODUCTION

● The great units of America's transportation system, her trucks and trains, depend heavily upon another transportation system to keep them rolling — the modern conveyer system. Without conveying equipment to speed materials to and from processing machinery, and into the cars and holds of ships, the transportation of vital war material would slow down considerably. Ships would remain longer in port — carloadings would fall off.

Long Mathews engineering hours are devoted entirely these days to the development of equipment for handling war material so that our prime movers can get it to where it is needed in less time.

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If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.

MATHEWS CONVEYERS FOR MECHANIZED PRODUCTION

and had to maintain speeds of not over one-quarter those used in his own plant.

Here is where the value of rebuilt machine tools came in. The prime contractor went to a well known rebuilder of machine tools and bought old planers that had been reconditioned with sufficient power and strength to handle carbide tools.

Keep 'Em Rolling

One of the problems to be ironed out in the subcontracting of defense work is to secure, so far as possible, a continuity of orders from the prime contractor to the subcontractor. This is second only in importance to keeping a flow of work into the shop of the prime contractor.

A case in point is the making of parts for some of the new tanks. A small shop in Virginia was given a number of rather intricate parts to make for a large prime contractor. When I visited the shop the other day they had nearly completed the initial order—and all the parts had passed inspection.

The job had necessitated the making of a number of fixtures and they naturally wanted another order. This has been promised but had not materialized. Unless it does they may have to take up other work which might delay tank production and increase cost by compelling some other small shop to rig up and get experience on this important job.

Cleanliness of Metal Parts

For blemish-free metal finishing, it is imperative that the product be chemically clean—free of all foreign material.

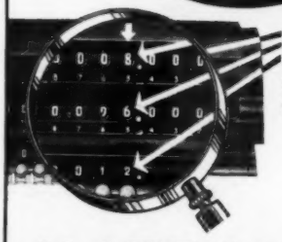
Although parts may look clean as they come from the cleaning room, it is entirely possible that traces of sand, scale or other extraneous material may still be adhering. When that happens rejects in the finishing room become a certainty, with a consequent waste and loss of production.

A simple test for iron castings, forgings, and sheet steel (except stainless) is to make a saturated solution of copper sulphate (blue vitriol) to which a slight amount of sulphuric acid (2 percent) has been added. This solution serves to detect the presence of iron in any form of iron, including its alloys, by forming a bright yellow copper coating on the surface of the article tested.

Where sand, iron oxide, or foreign material is present, the substance will remain in its original color or may be blackened.

The material suspected of being chemically unclean can be tested either by immersion in the solution or by rubbing the solution on the work with a swab, such as the type used for throat painting. Special emphasis should be given to the fillets and cavities in the piece, if enameling or plat-

for calculating
Circular Forming Tools
(with rake and gash)
and other uses!



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☐ *Send* "Simplified Sq. Root and Cube Root Method."
☐ *Send pamphlet* "Diam. of Circular Forming Tools with Top Rake."
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ing is to follow. It is a good idea to renew the solution or to redip the swab for each test to be made.

For abrasive blast cleaning, it is a simple matter to determine when all the pieces in a load in a Wheelebrator Tumblast are evenly cleaned; all the operator has to do is to stop the abrasive blast, open the door and conduct the test on a few selected pieces.

Habit Helps Hirohito

Winning this war depends more on using the facilities we already have than on building up huge plants for the production of planes, tanks and guns in 1943. Much of the success of this effort is in the lap of the designers and in the management of our plants.

Too much of our designing, as well as of our thinking, is done from habit—habit that was formed in pre-war days. A striking example, and a serious one, is the matter of ball and roller bearings. The demand is said to be far in excess of the capacity of both the alloy steels and of the plants that make the bearings.

Without in any way questioning the desirability of these ball and roller bearings, it is at least time to ask whether they are really necessary in all the places where they are specified. In high-speed, delicate and vital instruments, like the gyro-pilot, there is no question as to their necessity. But practical men are seriously questioning their being specified for the base ring of gun turrets on tanks or of airplanes, in view of the other important demands for them.

Practical designers are advocating the substitution of narrow-faced, plain rollers in places of this kind—with or without cages. The use of these rollers substitutes a simple and easily made bearing for one that is now taking balls needed elsewhere.

These plain rollers can be made from lower grade steels, cutoff in plain automatic machines, case-hardened and ground on a centerless machine by feeding them in a steady stream. A few calculations will show the load they can carry. These can be made easily and cheaply in many machine shops with standard equipment.

Without arguing against the use of ball and roller bearings in machine tools, their specification has become such a habit that we forget they are not indispensable. Thousands of excellent machines have been built with plain bearings, and many of these are still giving good service.

It is certainly better to get plain bearing machines quickly and without spending huge sums for new ball bearing plants. The building of every new plant takes men who might otherwise be turning out war products. It takes materials that should go directly into the war effort. Even assuming greater efficiency in machines with antifriction bearings, this cannot offset the added cost in time, in labor and in materials.

FOR *accuracy*
CADILLAC
THREAD
PLUG GAGES

AS specialists, we manufacture thread plug and ring gages for checking National, Whitworth and special form threads from your smallest size requirements to six inches in diameter. Special thread checking fixtures and thread alignment gages are built to customer's design. Orders and re-orders from the nation's largest armament manufacturers testify to the accuracy of CADILLAC Gages. *Let us serve you!!*

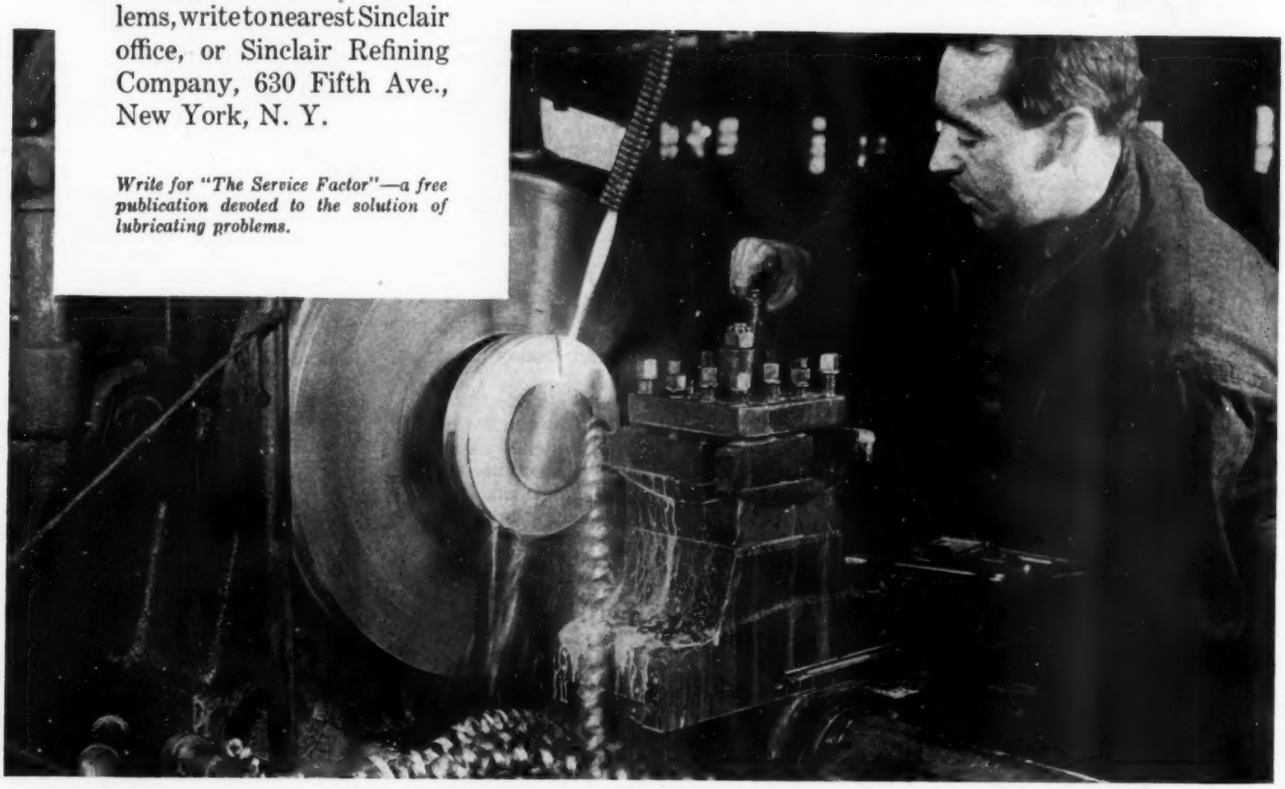
CADILLAC GAGE COMPANY
8016 Prairie Ave. Detroit, Mich.
★ MANUFACTURERS of
THREAD PLUG AND RING GAGES
AND OTHER THREAD CHECKING EQUIPMENT

Cadillac
OF
DETROIT

WAR SPEED-UP
cannot be fully maintained with inadequate lubricants. For *MACHINE TOOLED* plants there are . . .

. . . SINCLAIR CUTTING OILS and COOLANTS
designed for stepped-up, high precision cutting, and greater piece output between regrinds. These Sinclair brands offer economies in production, tool maintenance, and cutting oil costs. For full information and counsel about solution of cutting oil and coolant problems, write to nearest Sinclair office, or Sinclair Refining Company, 630 Fifth Ave., New York, N. Y.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



SINCLAIR INDUSTRIAL OILS

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

BOUT of the O'TOOLS

10 ROUNDS—AIR VS. HIGH-CYCLE GRINDERS

ROUND 5—A "SET-UP" FOR HIGH-CYCLE!

Job: Production grinding in a steel mill. Needed more portable tools so they called in the *Rotor Analyst.* Air supply was low. The *Rotor Analyst* demonstrated HIGH-CYCLE tools and compared performance and costs with AIR tools. Rotor HIGH-CYCLE grinders won the decision on these points:

1. *25% faster metal removal* is obtained on this job with HIGH-CYCLE tools.
2. *First cost lower* by $791. AIR tools would have required new compressor, costing about $1488. MG set for HIGH-CYCLE cost only $697.
3. *Power costs lower* by $500 yearly. MG set for HIGH-CYCLE required 16.8 K.W. less power than a compressor for AIR.
4. *25% longer wheel life* resulted with the HIGH-CYCLE grinders.

THE *ROTOR ANALYST* GOES "ALL-OUT" FOR OUTPUT!

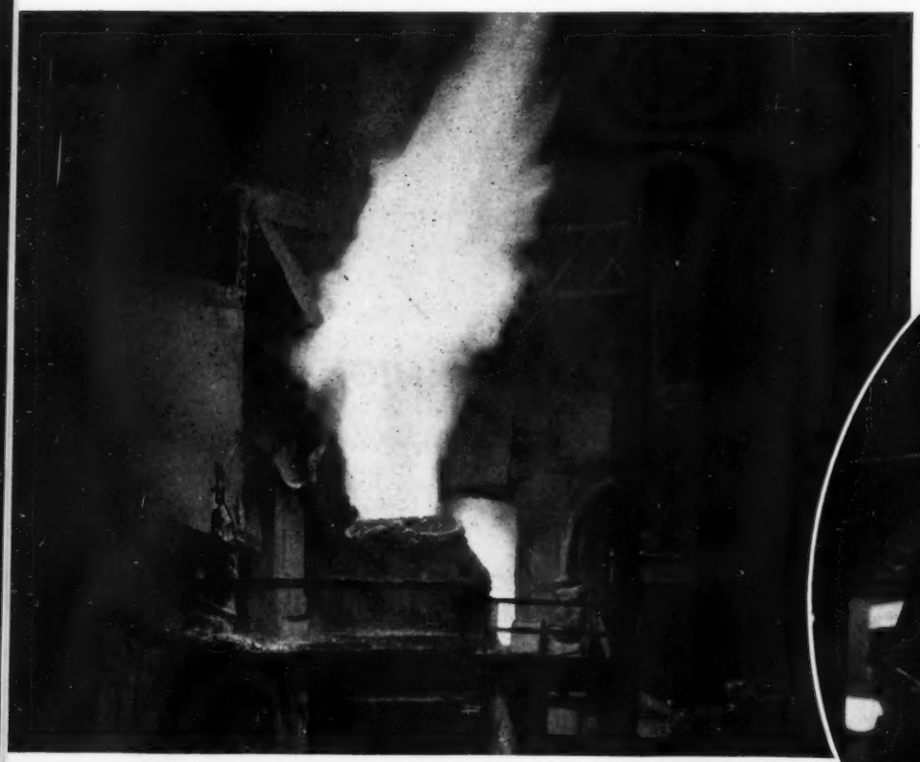
Want faster production from your existing AIR or HIGH-CYCLE installation? Want to add to your present capacity and keep the investment cost below par? Want to cut down on repair periods?

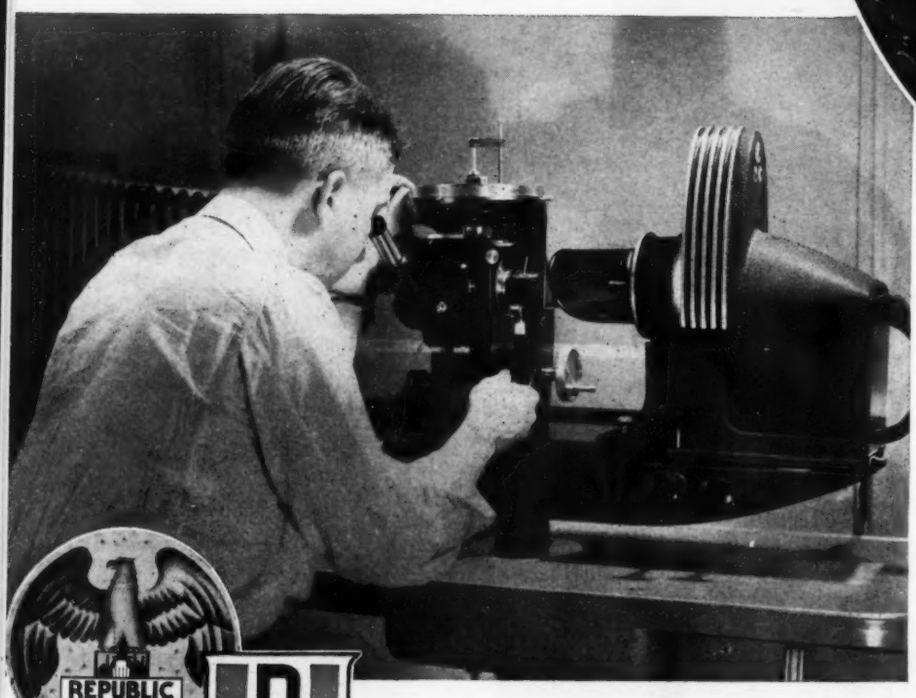
The *Rotor Analyst* tackles and licks problems like this every day. He can go "all-out" for results because he's unbiased—for AIR or HIGH-CYCLE. Call him in and get his recommendations. No obligation.

The Rotor Analyst has 65 different Air tools and 59 different High-Cycle tools with which to solve your problems.

STEEL BARS

TO DO TRICKS





To be high in MACHINABILITY, steel must be processed to possess this quality from the very beginning of its manufacture. This is the practice rigidly adhered to in the manufacture of Union Cold Drawn Steels. From furnace to draw bench to final inspection table, the steel is under the close control of experienced men whose most important job is to obtain uniformly high MACHINABILITY.

REPUBLIC STEEL
PRODUCTION FOR VICTORY

US

REPUBLIC **Union Cold**

"Trained from a Pup"

IN INCREASING PRODUCTION

If you want dependable performance from a dog, you begin to train it while still a pup—while it is raw material.

In the production of Union Cold Drawn Steels, we do practically the same thing. We begin our "training" of the steel with the raw materials—the iron ore, coke and limestone—and we continue to "train" the steel—to keep it under close controls in the furnace, soaking pit, blooming and bar mills, and, finally, during the cold drawing operations.

Throughout every process of manufacture, metallurgists who know from experience what it takes in steel to develop the *uniformly high MACHINABILITY* so important in steel parts production, carefully check each heat as it moves from step to step in its manufacture. Samples are thoroughly tested in the laboratory —and any heat that cannot meet Union Drawn's rigid specifications is promptly rejected.

Vigilant control—from ore yard to final inspection table—is one of the important reasons why you can always expect consistent uniformity in machinability, accuracy, physical properties, long tool life, smooth machined surface and heat-treating properties from Union Cold Drawn Steels—bar after bar and shipment after shipment.

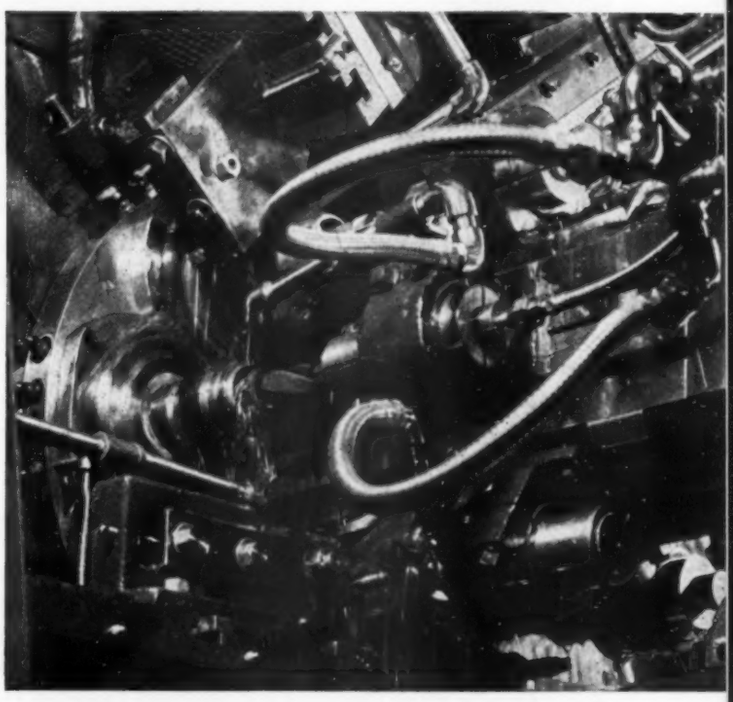
Another reason for the high degrees in which these qualities are found in Union Cold Drawn Steels is the relentless research conducted year after year by Union Drawn metallurgists and engineers. You'll find these men in steel parts plants studying today's requirements and the behavior of steels when machined or heat-treated. You'll find them in the laboratory, too—applying their training and field experience to the ever-present task of increasing *MACHINABILITY*.

They've met with success in both places—as demonstrated by the long series of improvements in Union Cold Drawn Steels—and by increases in output, better quality and lower costs for steel parts producers with whom they have cooperated. Today, the reputation of UNION FREECUT is firmly established as a free-machining Bessemer steel—and UNION SUPERCUT is the fastest-machining Bessemer screw steel made today.

Union Drawn metallurgists and engineers are ready to show you how to do tricks in increasing production with Union Cold Drawn Steels. They can help you select the most efficient available steel for each job—help you with "set-ups," speeds, feeds, and heat-treating methods. Tell us what you're up against. We'll do our best to help you.

UNION DRAWN STEEL DIVISION
REPUBLIC STEEL CORPORATION
MASSILLON • OHIO

Berger Manufacturing Division • Niles Steel Products Division
Steel and Tubes Division • Culvert Division • Truscon Steel Company



Union Drawn Steels

Free-Machining Bessemer, Open-Hearth and Electric Furnace Steels

•

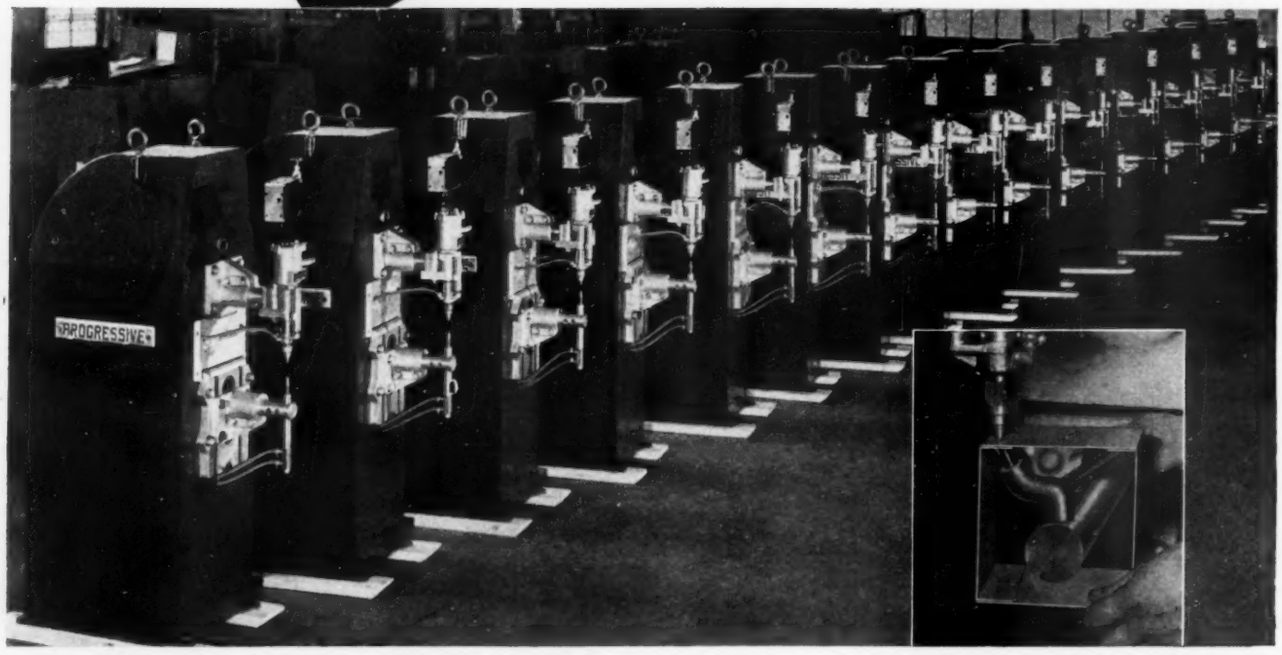
Union Cold Drawn Special Sections

•

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting).

AVERAGE DELIVERY TIME 3 to 4 WEEKS!

..on PROGRESSIVE'S PEDESTAL TYPE SPOT WELDERS



DESPITE peak production levels and peak demand for welding equipment, Progressive has been able to maintain, so far, an average delivery time of only 3 to 4 weeks on complete pedestal type spot welders, ready for use. Quantity production—*and production ahead of orders, as far as possible*—is the only way in which this could be done.

Moreover, while these pedestal welders—in capacities from 35 to 200 KVA have been in regular production, numerous improvements have been incorporated including the availability of a new and improved shunt type of head. This head is also available, if desired with an attachment permitting its being swiveled a total of 180 degrees, while the lower arm may also be obtained with a rotatable construction. These special features permit clearing of obstructions and welding at various angles, in corners, etc.

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CLEVELAND Frank Stockton	MILWAUKEE K. W. Stroffregen	PITTSBURGH Frank Stockton
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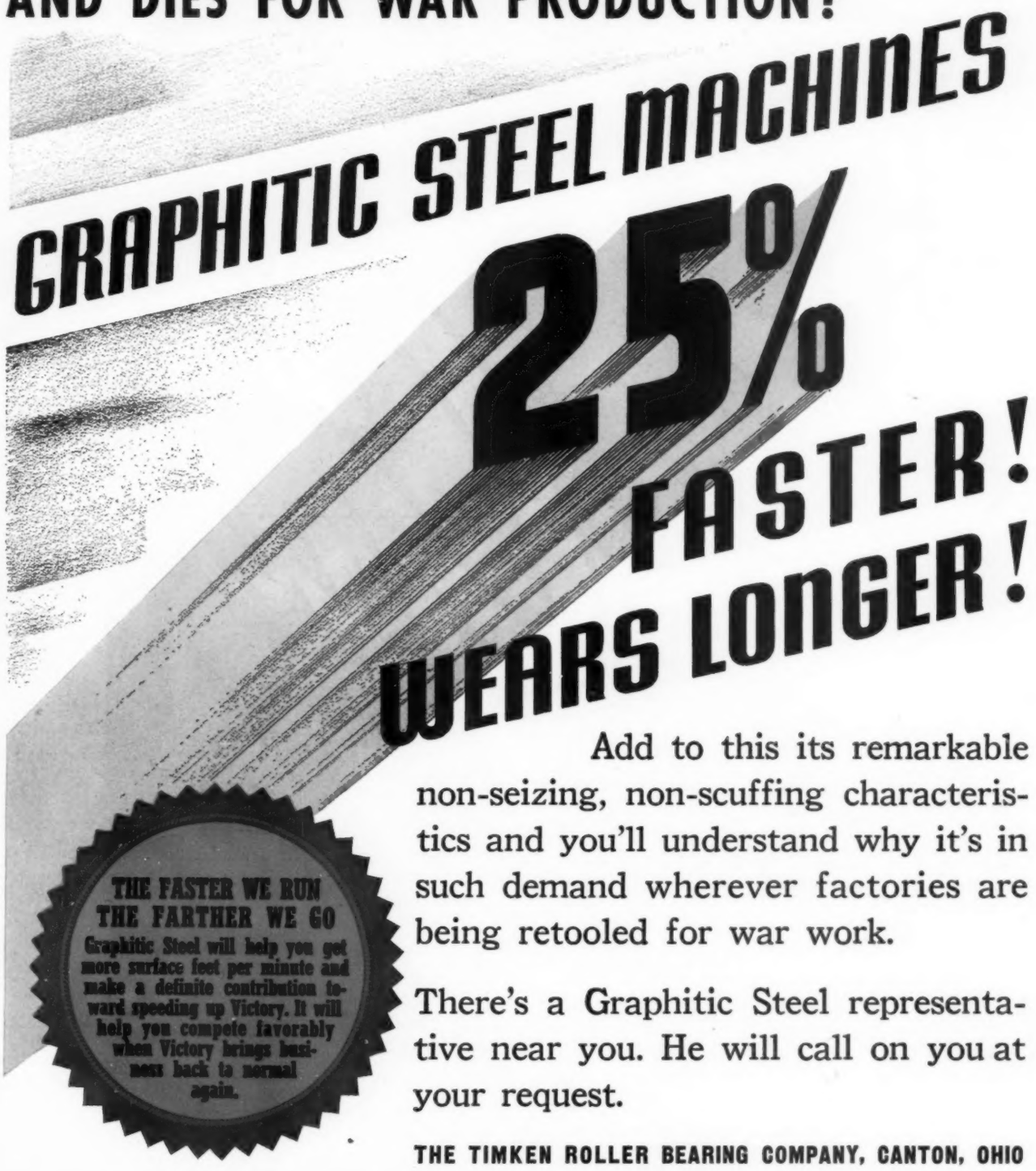
PROGRESSIVE WELDER CO.

3050 E. Outer Drive, Detroit, U. S. A.

ARE YOU CONVERTING YOUR MACHINES, TOOLS AND DIES FOR WAR PRODUCTION?



THE FASTER WE RUN THE FARTHER WE GO

Graphitic Steel will help you get more surface feet per minute and make a definite contribution toward speeding up Victory. It will help you compete favorably when Victory brings business back to normal again.

Add to this its remarkable non-seizing, non-scuffing characteristics and you'll understand why it's in such demand wherever factories are being retooled for war work.

There's a Graphitic Steel representative near you. He will call on you at your request.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN

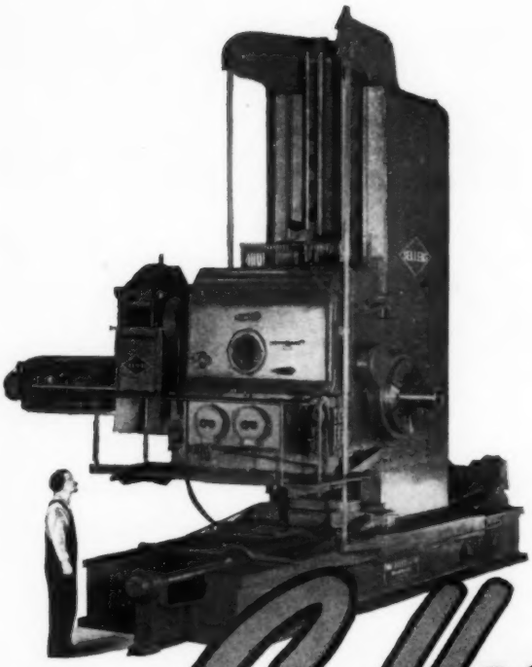
TRADE-MARK REG. U. S. PAT. OFF.

GRAPHITIC STEELS

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; and Timken Rock Bits.

FOUNDED
SELLERS
1848

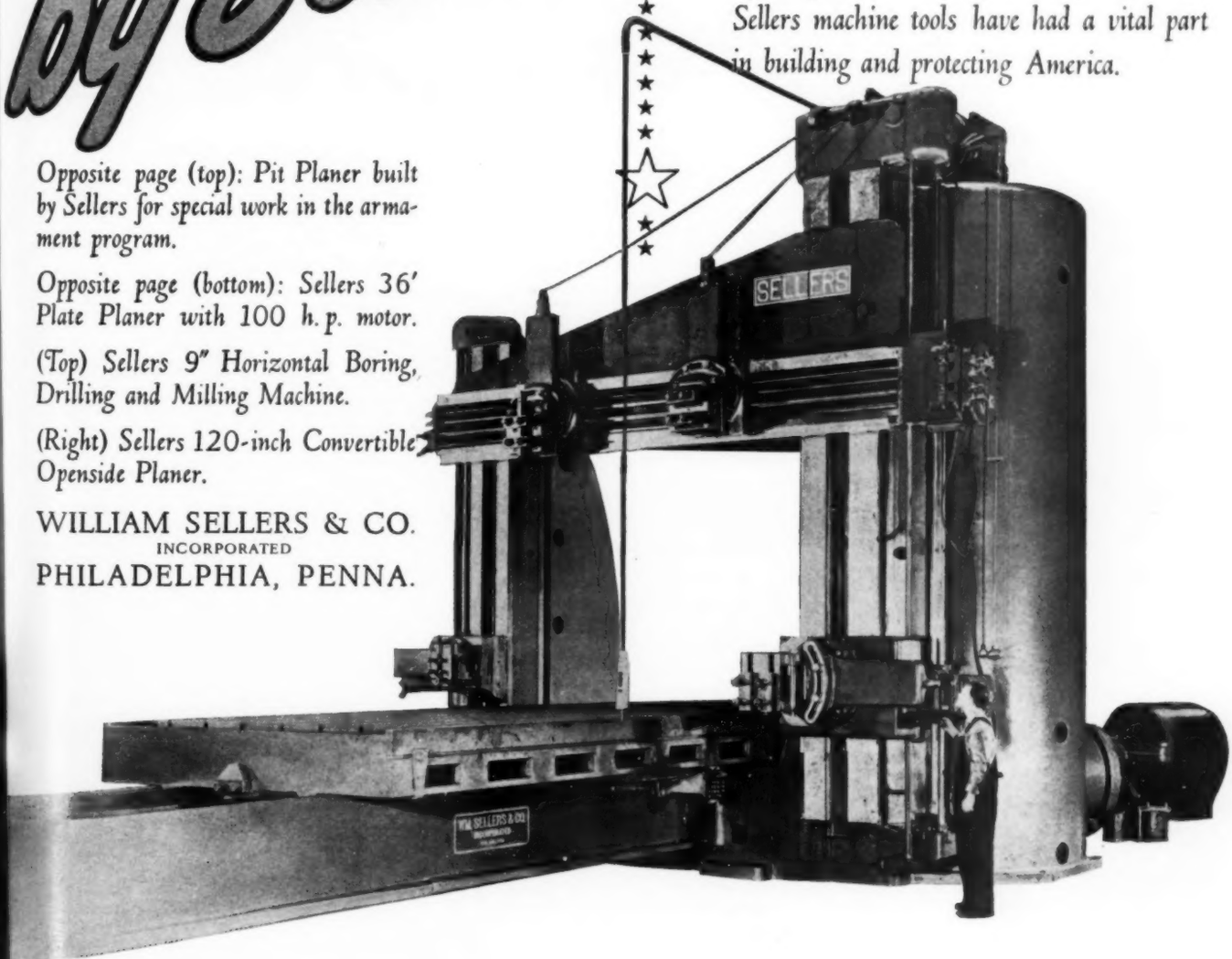
Sellers



by Sellers

While World War No. 2 has developed the need for more powerful and more gigantic machines and the tools to build them, all previous wars have had a like effect on the size of machinery. ★ William Sellers & Company, in their long history, have built machine tools for the needs of four major wars. ★ The experience of this organization in designing and building special machinery to unusual dimensions has always been placed at the disposal of those governmental departments and officials charged with securing the greatest possible output of the weapons and munitions of war.

In peace and war for nearly a century, Sellers machine tools have had a vital part in building and protecting America.



Opposite page (top): Pit Planer built by Sellers for special work in the armament program.

Opposite page (bottom): Sellers 36′ Plate Planer with 100 h. p. motor.

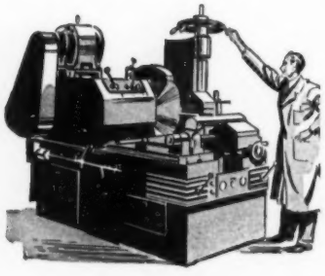
(Top) Sellers 9″ Horizontal Boring, Drilling and Milling Machine.

(Right) Sellers 120-inch Convertible Openside Planer.

WILLIAM SELLERS & CO.
INCORPORATED
PHILADELPHIA, PENNA.

THE MOTCH & MERRYWEATHER SEGMENTAL SAW BLADE

Goes Right Through!

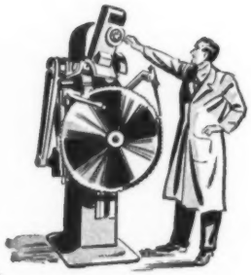


Motch & Merryweather Cold Sawing Machines for single and multiple cutting handle up to 14-1/2" square and 16" round stock.

Not so long ago, while a visiting technician was still "getting set" to time the operation, the Motch & Merryweather Cold Saw had flashed through the cut—in a matter of seconds. Speed like that, with clean, square sections, without chatter, without burrs, and without scrap, does not just happen, nor is it achieved over night. It is due in large measure to the perfected design and experienced workmanship of the M. & M. Segmental Saw Blade. . . . The remarkable records being made by the Motch & Merryweather Cold Sawing Combination (saw, blade and grinder) spring from a continuous contact with the metal-sawing field that reaches back over twenty years.

★ ★ ★

Only Motch & Merryweather builds cold sawing machines, saw blades and saw grinders, and assumes full responsibility for the complete installation.



The M. & M. Automatic Saw Grinder imparts the correct tooth contour, which means greater speed and fewer sharpenings.

THE MOTCH & MERRYWEATHER MACHINERY COMPANY • PENTON BUILDING • CLEVELAND, OHIO

Built by **MOTCH & MERRYWEATHER**

MOTCH AND MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT
CINCINNATI PITTSBURGH

Let a Meehanite Foundry Solve Your Casting Problems

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For Sintered Carbide Tools
Meehanite SHANKS
REDUCE TOOL BREAKAGE
INCREASE TOOL LIFE
See your MEEHANITE Foundry for data on Tool Shanks in various styles for lathes, shapers, boring mills and other machine tools.
For GREATER Vibration Absorption BETTER Heat Conductivity HIGH Strength and Rigidity

The increasing popularity of tools tipped with sintered carbides emphasizes the advantages of MEEHANITE Tool Shanks for this service.

MEEHANITE'S exceptional ability to absorb vibration, combined with its strength and rigidity, reduces tool breakage and increases tool life. Its easy machinability (3 to 5 times faster than steel) saves valuable hours milling the recesses for tips. MEEHANITE shanks are lighter in weight and lower in cost than steel. Tips stay on better, due largely to the fact that the coefficient of expansion of MEEHANITE closely approaches that of sintered carbides.

A test of a sintered carbide-tipped MEEHANITE Tool Shank under normal operating conditions recently gave the following data: 35 hours at 217 surface feet per minute on high grade MEEHANITE castings and 8 hours at 389 surface feet per minute on chilled castings. After grinding, the same tool ran 16 hours at 245 surface feet per minute and 24 hours at 210 surface feet per minute on high grade MEEHANITE castings. Subsequently this tool ran 359 hrs.

To assure best service from your sintered carbide tools, get in touch with the nearest MEEHANITE Foundry.

MEEHANITE RESEARCH INSTITUTE · 311 ROSS STREET · PITTSBURGH, PA.

MEEHANITE
SEND FOR BOOKLET

Write for Engineering Bulletin No. 9—"Meehanite, the Metal for Machine Tool Castings."

This very day

FERRACUTE BLUEPRINTS THE FUTURE OF YOUR BUSINESS

If your production depends on presses, you have a very real stake in Ferracute's blueprints of today. They may be your best weapon in the coming peace-time battle of "the survival of the fittest."

For it is the sound engineering principles of Ferracute design that are - - and will be - - responsible for the economy, precision and speed of Ferracute press performance.

Ferracute's engineers and its specialists in feed attachments and high-production methods are vigilant to maintain this superiority of design - - and to keep it geared to industry's present - - and future - - requirements. This constant search for improvement in design goes steadily forward even while Ferracute hangs up new records for press deliveries to vital defense plants.

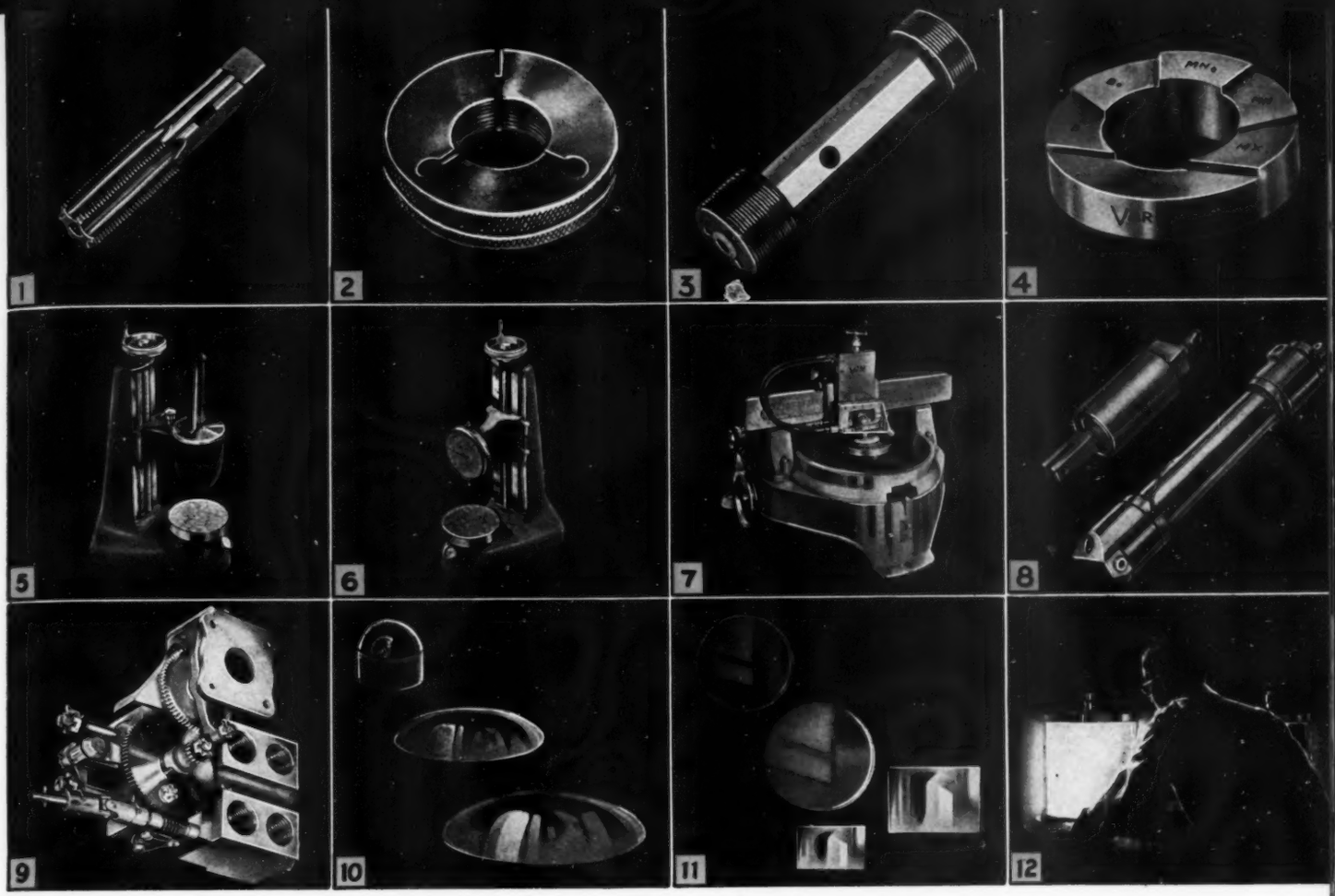
Typical of Ferracute's advanced engineering and designing—
Ferracute Press P G 3.
The third size of the Streamlined Series of punching presses of the geared type.

Ferracute Press D D G 2.
A double-action inclineable press used to make a difficult combination blank and pierce operation automatically.

TRADE FERRACUTE MARK

Ferracute Press S D G 112.
A special-purpose, double-action press of tie-rod construction designed for use with multiple dies and automatic feed.

FERRACUTE
MACHINE COMPANY
PRESSES AND PRESS BRAKES
Bridgeton, New Jersey



These are VARD's contributions to American manufacturing supremacy

Here are twelve products, developed in our engineering department and converted into commercial manufactured items in our technical shops.

These twelve fall into three classifications: precision checking tools of high fidelity, operating instruments for aircraft and ordnance manufacture, and optical goods and a process of treating optical glass.

In the picture above, No. 1, shows a VARD precision tap. We build these to order of special steels, special and left hand threads —in fact, the kind hard to get anywhere else. No. 2, is an internal thread ring gage. We build these in a wide variety of sizes with similar, cylindrical, ring gages. No. 3, is a plug gage, with "Go" and "No Go" threads. These, as well as cylinder plug gages, are built in all sizes. No. 4, is one of our plain taper, ring gages for checking pipe threads.

Far more sensitive and accurate than the first four, are the VARD external comparators, No's. 5 and 6, above. These beautifully made checking instruments, quickly indicate variations in size of work one ten-thousandth of an inch. Both are bench models, easy to move and easy to read.

No. 7, is a circular dividing machine. It accurately divides circular discs into predetermined segments. It is used in the manufacture of dials, protractors and instruments. We build both circular and linear dividing machines.

Actual operating parts of planes, such as the hydraulic cylinders, No. 8, and wing flap indicator, No. 9, are precision built to plane manufacturers' design. We have turned out a great quantity of such equipment and are now increasing our plant to handle more.

Optical lenses, mirrors, and filters, as shown in No's. 10 and 11, are important among our products. In the processing of some of these units, we use a newly developed scientific method of vacuum-evaporation, No. 12, to deposit durable coatings on the glass. These coatings, either form a brilliant reflecting surface, in mirrors, or materially reduce surface reflection, in lenses or prisms. This process of Opticote is a new scientific discovery.

In 1942 VARD will continue to serve the U. S. A. and you.

The VARD trademark on a product symbolizes thorough engineering, the best in materials, and technical, precision workmanship.

VARD INC. PASADENA, CALIFORNIA, U. S. A. • SUCCESSOR TO VARD MECHANICAL LABORATORY

No. 2

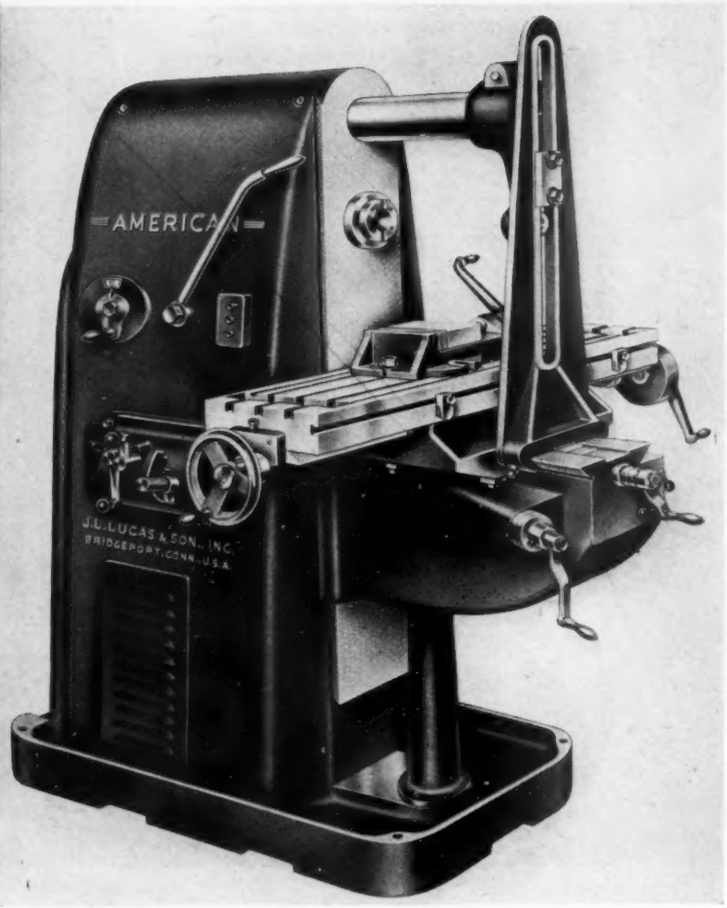
American

PLAIN MILLING MACHINE

featuring

★ INFINITE SPINDLE SPEEDS
★ MOTOR-IN-BASE DRIVE
★ STANDARDIZED SPINDLE NOSE
★ HEAVY RUGGED CONSTRUCTION

Applicable to the Needs of National Defense . . .



Designed and built to assure speed, accuracy and convenience in handling a wide variety of work, the No. 2 American Plain Miller can be of outstanding help in any shop engaged in armament production.

. . . spindle is heat treated chrome-nickel steel and runs in heavy phosphor bronze bearings compensated for wear and equipped with alemite lubrication fittings; a standardized flange spindle nose is used having a number 40 taper.

. . . motor in base is the U. S. Vari-Drive, ball bearing throughout.

. . . infinite variations in speed are instantly available while machine is in operation.

. . . convenient controls for speed and feed are located centrally for ease of operation; all operating levers are placed for manipulation with minimum effort.

. . . heavy column completely houses motor drive and all power shafts.

. . . table is designed for sturdiness and maintained alignment with working surface having generous oil pockets and with three Tee-slots; table has both power longitudinal and power transverse feeds.

CONDENSED SPECIFICATIONS

TABLE WORKING SURFACE – 46" x 10½"

LONGITUDINAL POWER FEED – 25"

TRANSVERSE POWER FEED – 9"

VERTICAL HAND FEED – 19"

MAX. DISTANCE SPINDLE TO TABLE – 19"

SPINDLE SPEEDS – Infinite

RANGE OF SPINDLE SPEEDS – 25-500 R.P.M.

NUMBER OF GEARED FEEDS – 16

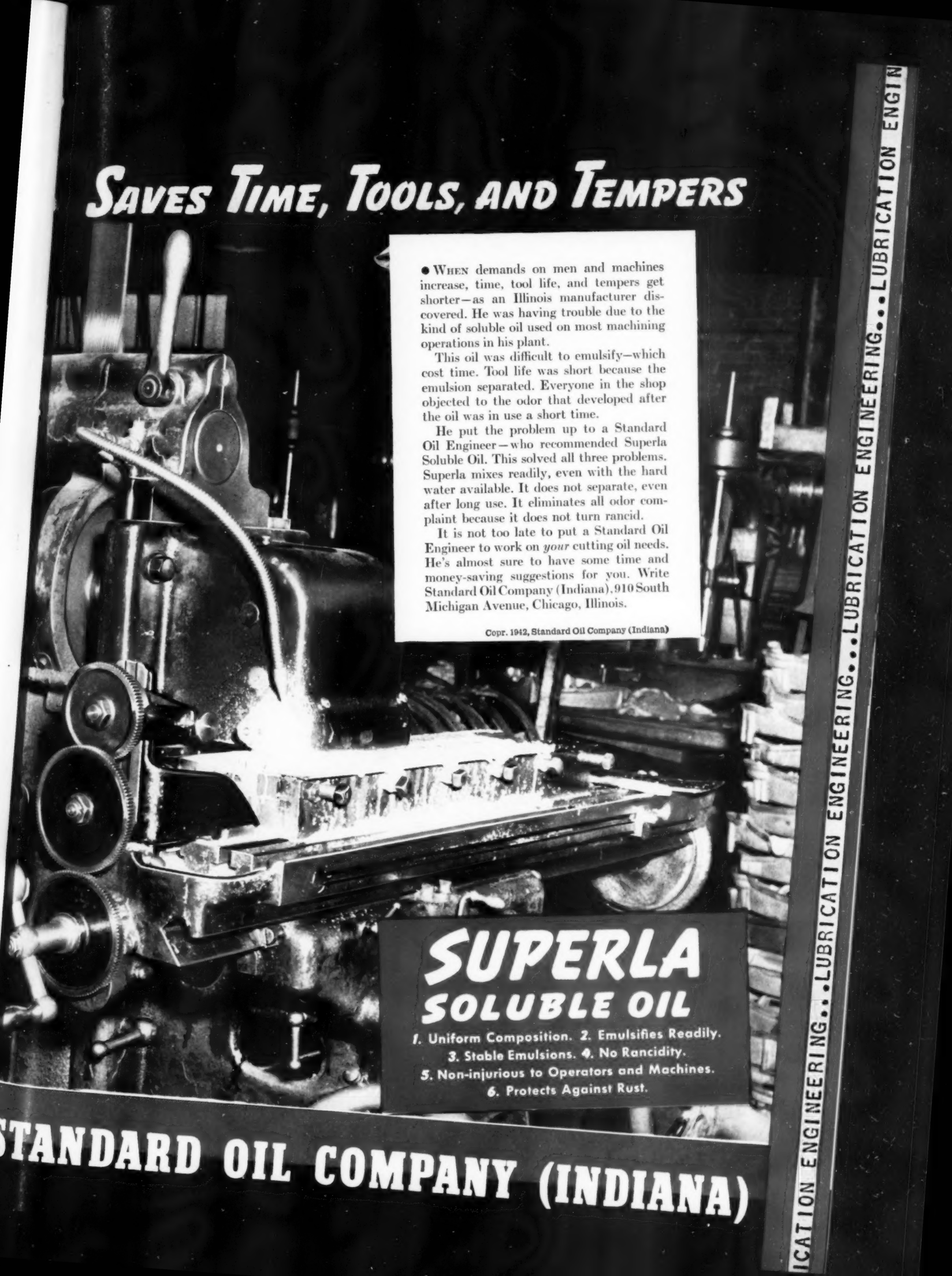
RANGE PER SPINDLE REVOLUTION – .005" to .212"

NET WEIGHT – 4240 LBS.

COMPLETE DETAILS AVAILABLE PROMPTLY ON REQUEST

J. L. LUCAS & SON, INC.

BRIDGEPORT, CONNECTICUT, U.S.A.


SAVES TIME, TOOLS, AND TEMPERS
• WHEN demands on men and machines increase, time, tool life, and tempers get shorter—as an Illinois manufacturer discovered. He was having trouble due to the kind of soluble oil used on most machining operations in his plant.
This oil was difficult to emulsify—which cost time. Tool life was short because the emulsion separated. Everyone in the shop objected to the odor that developed after the oil was in use a short time.
He put the problem up to a Standard Oil Engineer—who recommended Superla Soluble Oil. This solved all three problems. Superla mixes readily, even with the hard water available. It does not separate, even after long use. It eliminates all odor complaint because it does not turn rancid.
It is not too late to put a Standard Oil Engineer to work on your cutting oil needs. He's almost sure to have some time and money-saving suggestions for you. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois.
Copr. 1942, Standard Oil Company (Indiana)
SUPERLA
SOLUBLE OIL
1. Uniform Composition. 2. Emulsifies Readily.
3. Stable Emulsions. 4. No Rancidity.
5. Non-injurious to Operators and Machines.
6. Protects Against Rust.
STANDARD OIL COMPANY (INDIANA)
LUBRICATION ENGINEERING • • • LUBRICATION ENGINEERING • • • LUBRICATION ENGIN

NG...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICAT

Dipping parts is one economical Stanorust application. Only a thin film of rust preventive clings to the pieces, but it will protect them over long periods of storage.

RUST IS EVERYONE'S ENEMY... FIGHT IT WITH STANORUST

If you are producing machined parts on a sub-contract, have you taken steps to make sure that your part of the job reaches the assembly plant clean and free from rust?

A rusted shipment might be reclaimed by grinding, but this would cost time and money—time that could seriously tie up vital assembly operation—money that would more than pay for adequate rust protection at the start.

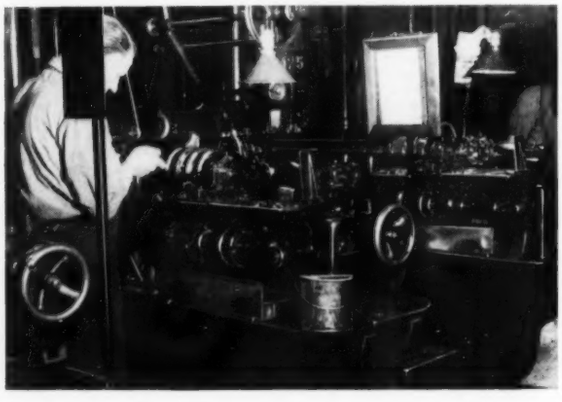
Play safe. Let a Standard Lubrication Engineer analyze your problem—the storage and shipping conditions to be met—the best method of applying a rust preventive to your product. Then test the grade of Stanorust he recommends.

Complete rust protection is just one advantage you'll find. Stanorust is easy to apply. Parts may be dipped, sprayed, or swabbed. It does not harden, crack, or peel, even after long periods of storage. It is easily removed with a cloth wet with kerosene.

All these advantages can easily be demonstrated. Just ask a Standard Lubrication Engineer for a trial.

REDUCE STOCKS OF CUTTING OILS... SAVE TIME AND TOOLS WITH ACME CUTTING OIL

The superintendent of the screw machine department in a Minnesota plant was using one cutting oil for all operations. This had the advantage of simplifying oil stocks.



But now and then tools would wear rapidly, and work finish was not uniform. He asked a Standard Oil Engineer why.

An analysis by the Engineer brought out the reason and the solution. A comparatively light oil was being used. It was economical, but it was not heavy enough for some jobs. The Engineer recommended Acme Cutting Oil—a highly sulfurized mineral oil—heavy enough for the toughest work. For the lighter jobs, Acme was cut back with paraffin oil and the Engineer determined the mixtures required. The superintendent still has one oil to stock, but he gets good tool life and uniform finish on *every* operation. See if a Standard Oil Engineer hasn't a number of cost-saving suggestions for you.

STEP UP OLD MACHINES... TRY NEW LUBRICANTS

Are you overlooking new lubricants as a means of putting new life into old machines, tools, and power transmission equipment? Standard Oil has developed a number of lubricants which may help you. A new dripless oil, Stanodrip, is designed for bearings which throw off ordinary oils and require frequent attention or tend to overheat. Stanolex Oils are specially compounded to eliminate chatter in machine ways and guides. These are just two of a number of important aids to war-time production speed. Let a Standard Oil Engineer show you where a new lubricant or cutting oil might help you. Just write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

COLORADO
Denver
ILLINOIS
Chicago
Decatur
Joliet
Peoria
Quincy
INDIANA
Evansville
Indianapolis
South Bend

IOWA
Davenport
Des Moines
Mason City
KANSAS
Wichita
MICHIGAN
Detroit
Grand Rapids
Saginaw

MINNESOTA
Duluth
Mankato
Minneapolis
MISSOURI
Kansas City
St. Louis
St. Joseph
MONTANA
Billings

NORTH DAKOTA
Fargo
SOUTH DAKOTA
Huron
WISCONSIN
Green Bay
La Crosse
Milwaukee
WYOMING
Cheyenne

Scully Service

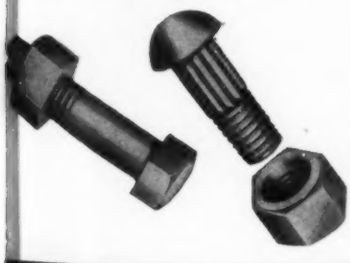
Structural material
Plates, various qualities
Floor Plates
Sheets: Hot Rolled, Cold Rolled, Galvanized, etc.
Bars (all shapes): Hot Rolled, Carbon and Alloy grades
Hot Rolled Strip Steel
Spring Steel · Tool Steel
Drill Rod
Cold Finished Bars, Carbon and Alloy grades
Wire
COR-TEN and MAN-TEN Shapes, Sheets and Plates
Abrasion-Resisting Sheets and Plates
Eaves Trough, Conductor Pipe
U·S·S Stainless Steel and Stainless products
Expanded Metal
Rails
Boiler Tubes
Rivets, Bolts, Nuts, Washers
Dardelet Rivet and Machine Bolts
Nails
Welders and Welding Accessories
Chain
Clamps
Flanges
Expanders, etc.
Hoists, Shears, Rolls, Punches, Cut-Off Machines, Saws, Nibblers, etc.

In Stock! Dardelet Bolts

We can offer immediate shipment of both Dardelet Rivet Bolts and Dardelet Machine Bolts. These bolts save valuable time and labor and assure permanently tight bolts.

The Dardelet Rivet Bolt is a ribbed bolt with Dardelet self-locking thread, and is widely used for field erection of structural steel. Has recessed nut. Bolt is driven in and nut is applied with wrench. Economical and strong.

The Machine Bolt with Dardelet self-locking thread is for general use where vibration is present.



STEELS THAT MEET THE CHALLENGE OF TODAY AND TOMORROW

USS

Don't give up without calling Scully!

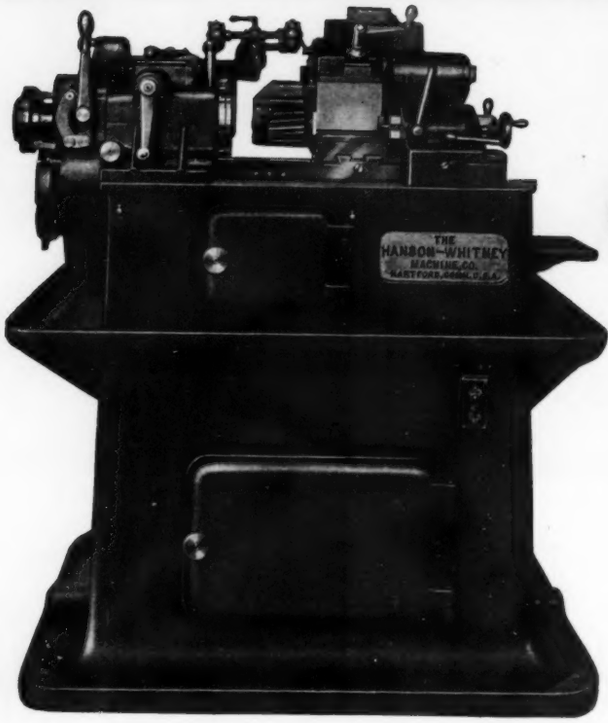
CHICAGO	**BRUnswick 2000**
Teletype CG. 605	
BALTIMORE	**GILmore 3100**
Teletype BA. 63	
BOSTON	**STAdium 9400**
CLEVELAND	**HEnderson 5750**
Teletype CV. 153	
PITTSBURGH	**CEdar 7780**
Teletype PG. 475	
ST. LOUIS	**MAin 5235**
MINNEAPOLIS - ST. PAUL	**NEstor 2821**
NEWARK, N. J.	**Bigelow 3-5920**
	BErgen 3-1614 - REctor 2-6560

SCULLY STEEL PRODUCTS COMPANY

Distributors of Steel and Steel Products

UNITED STATES STEEL

THREAD PRODUCTION



for Internal and External Threads

Perfect threads at a high rate of speed are assured by HANSON-WHITNEY SEMI-AUTOMATIC THREAD MILLING MACHINES.

These modern machines will enable you to step-up the production of either internal or external threads without danger of spoiling work and with maximum operating convenience. Closest limits of accuracy are assured even on parts that are difficult to thread by other methods.

These advantages are attained with H-W THREAD MILLERS through employing multiple cutters which finish the thread in one revolution of the work. This time-saving method on H-W Thread Millers makes the machines capable of producing external or internal, right or left hand threads as well as taper threads with utmost accuracy.

Let Hanson-Whitney show you how you can eliminate bottlenecks in thread production with H-W Thread Millers. Send at once for bulletins giving complete, detailed information.

Hanson-Whitney 4x9 inch Semi-Automatic Thread Milling Machine

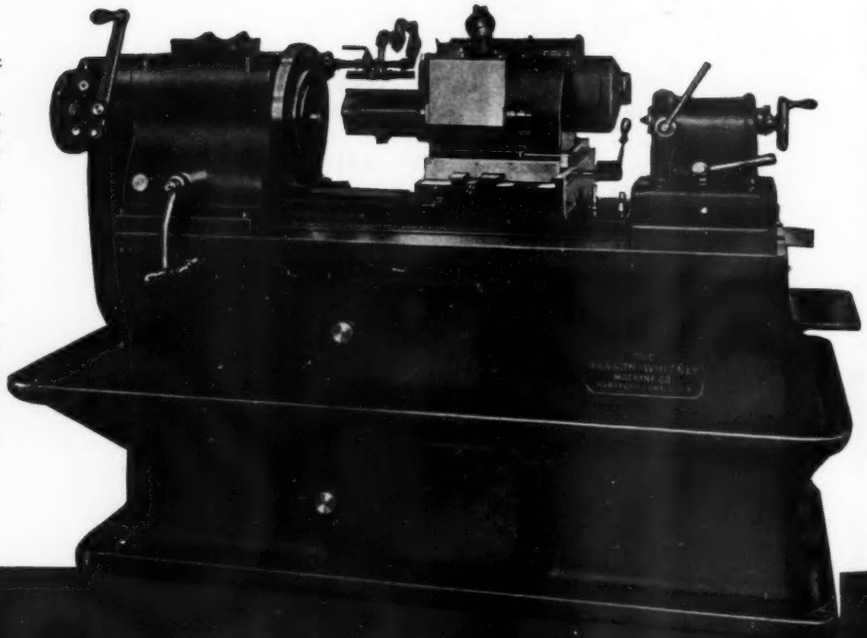
4" diameter external capacity with 2" cutter. 4" maximum diameter internal capacity with 2" cutter and ¾" minimum diameter with ½" cutter.

Hanson-Whitney 8x16 inch Semi-Automatic Thread Milling Machines.

8" diameter internal capacity with 2½" cutters. 8" maximum diameter, internal capacity with 2½" cutter and 1" minimum diameter with 7/16" cutter.

Hanson-Whitney 10x24 inch Semi-Automatic Thread Milling Machine.

10" diameter external capacity with 2½" cutter. 10" maximum diameter internal capacity with 2½" cutter and 1" minimum diameter with ⅞" cutter.



THE HANSON-WHITNEY

Hartford,

and adequate threads assured

for faster, more accurate threaded holes

Speed and precision in production are recognized advantages assured by H-W Taps.

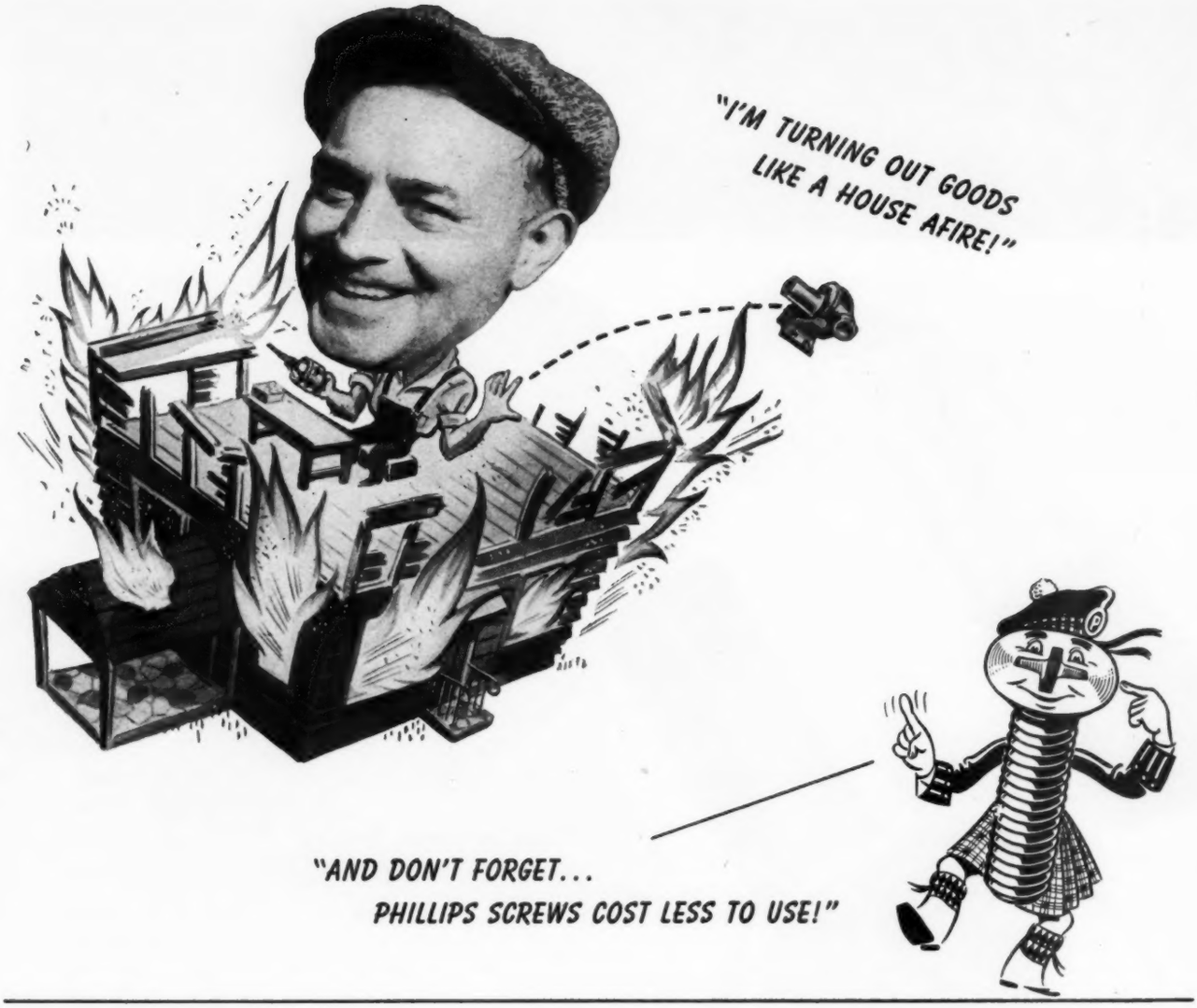
By employing the "Hanson-Process" of manufacture, by which scientific control of heat-treating is assured and then finishing after hardening, H-W taps can be depended upon for unvarying correctness in pitch and form as well as greater precision, longer life and faster tapping.

H-W Taps invite closest scrutiny. Their keen cutting edges, so essential to high speed, accurate thread production are clearly visible on examination. To use H-W Taps, however, is to appreciate their real value as high production, precision tools.

Completeness of the H-W line, makes the right tap available for every tapping need.

MACHINE COMPANY

Connecticut

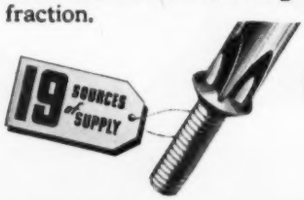


Faster Driving • Fewer Operations • Stronger Fastenings = 50% Less Assembly Cost with Phillips Screws!

Consider the more frequent use of power drivers with Phillips Screws. There's no danger of driver point slipping from a Phillips recess, so there's no need to go slow. Phillips cuts actual screw-*driving* time to a fraction.

Add the saving through eliminating the extra work required with slotted screws — drilling pilot holes, two-handed starting, withdrawing crooked screws, driving in awkward positions, etc. Phillips Screws set up tight — without split screw heads or burrs — at an average cost saving of 50%.

Busy defense plants are using Phillips for double-quick assembly *speed.* Non-defense plants use Phillips for 50% less assembly *cost.* Get the facts from one of the firms listed below.



PHILLIPS RECESSED HEAD SCREWS

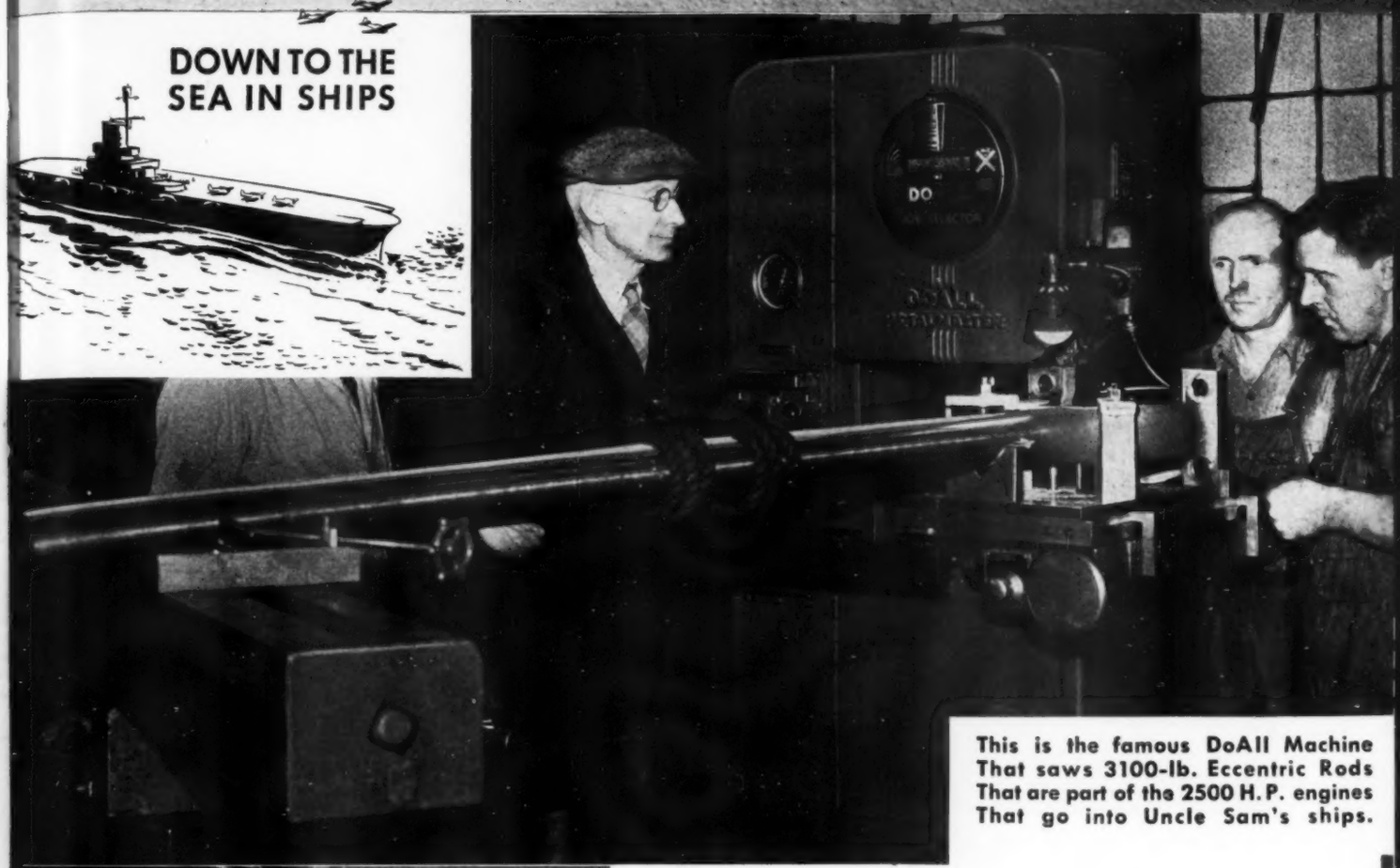
GIVE YOU *2 for 1* **(SPEED AT LOWER COST)**

WOOD SCREWS • MACHINE SCREWS • SHEET METAL SCREWS • STOVE BOLTS • SPECIAL THREAD-CUTTING SCREWS • SCREWS WITH LOCK WASHERS

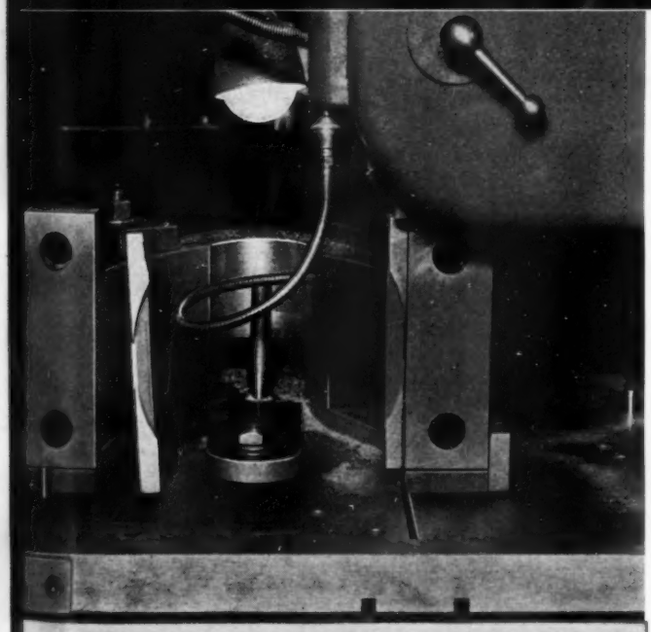
U. S. Patents on Product and Methods Nos. 2,046,343; 2,046,837; 2,046,839; 2,046,840; 2,082,085; 2,084,078; 2,084,079; 2,090,338.
Other Domestic and Foreign Patents Allowed and Pending.

American Screw Co., Providence, R. I.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
The Charles Parker Co., Meriden, Conn.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterbury, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
Whitney Screw Corp., Nashua, N. H.

DoAll SPEEDS PRODUCTION



This is the famous DoAll Machine
That saws 3100-lb. Eccentric Rods
That are part of the 2500 H. P. engines
That go into Uncle Sam's ships.



7 HOURS' WORK IN 1 HOUR

At Filer & Stowell Co., Milwaukee, Wis., this Connecting Rod formerly took 7 hours to machine by boring and slotting. Now DoAll does the same work in 1 hour, and the slotter and boring mill are released for other work.

The DoAll sets new production records. Takes the place of shaper, milling and lathe work on hundreds of operations. Priced from $1,000 to $5,000 complete with necessary equipment. Worth its weight in gold —Investigate the DoAll at once.

Let us send a factory-trained man to your plant with a DoAll to show you what it can do and save for you.

DoAll Contour Sawing
BAND SAWING
BAND FILING
BAND POLISHING

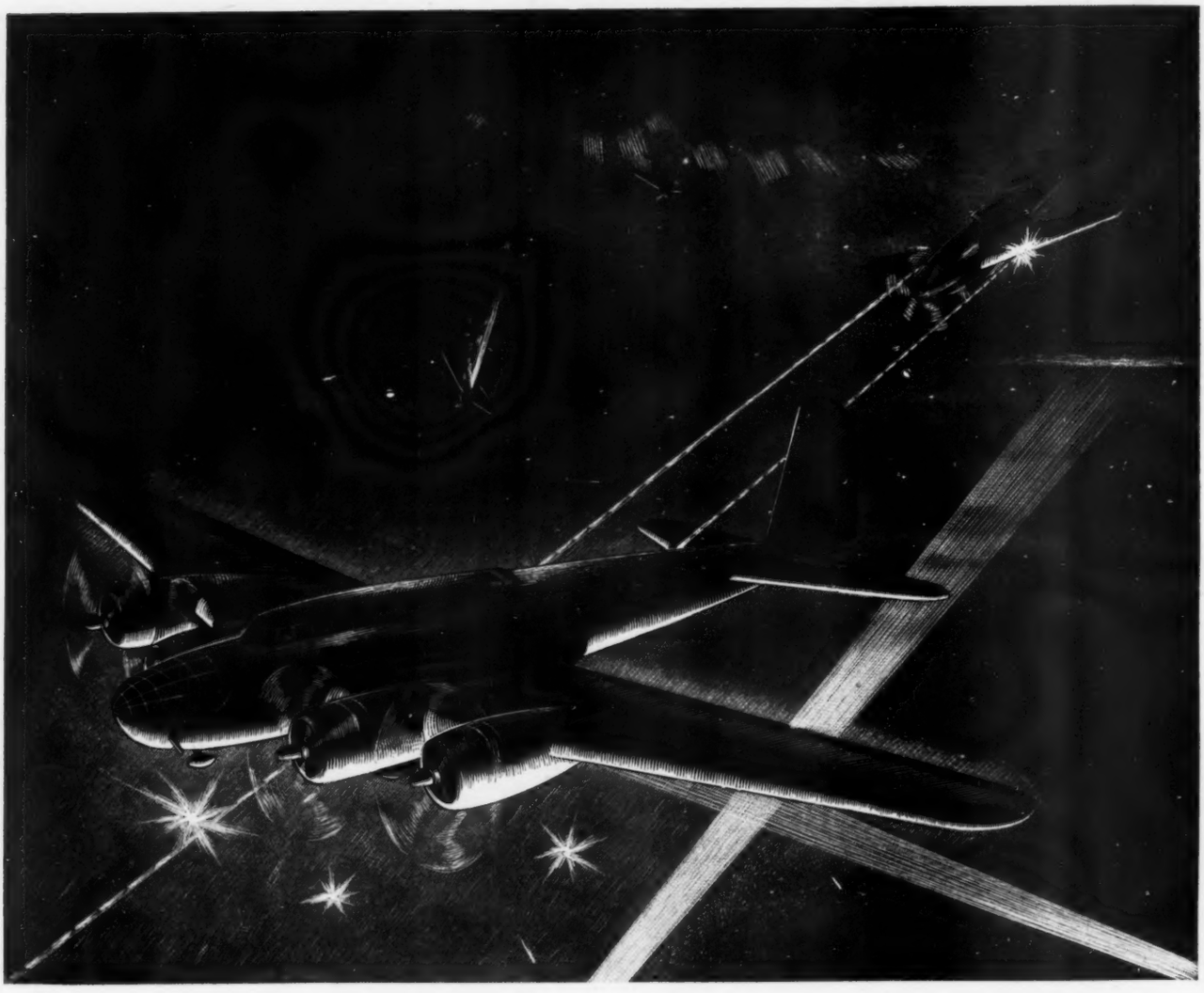
★ Fastest Precision Method of Removing Metal

NEW Interesting and Valuable book "DoAll on Production" free on request.

CONTINENTAL MACHINES, INC.

1310 S. WASHINGTON AVE., MINNEAPOLIS, MINN.

Associated with the DoAll Company, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.



When fighting engines strain against studs of steel

SMALL but vitally important are the steel studs used in assembling the engines of fighting planes. Made of one of the toughest alloy steels, they are unusually difficult to machine rapidly and accurately.

Rejections were running far too high in one well-known plant making these parts. The problem was put up to Shell. Using existing equipment without change, and the recommended Shell Cutting Oil, production speed shot up 50% . . . rejections practically vanished. And cutting tools delivered more than twice as many studs before regrinding was necessary.

Shell men were able to offer this kind of service because Shell Industrial Lubricants are up-to-the-minute in every respect. Yet Shell, realizing that tomorrow's production schedules will present even more difficult problems, is constantly improving Shell Lubricants to meet future needs.

• • •

Have you checked the effectiveness of your lubricants lately? When you use Shell products you can be sure you are getting an advanced, efficient and practical lubrication service . . . a definite help in the greatest production program in history.

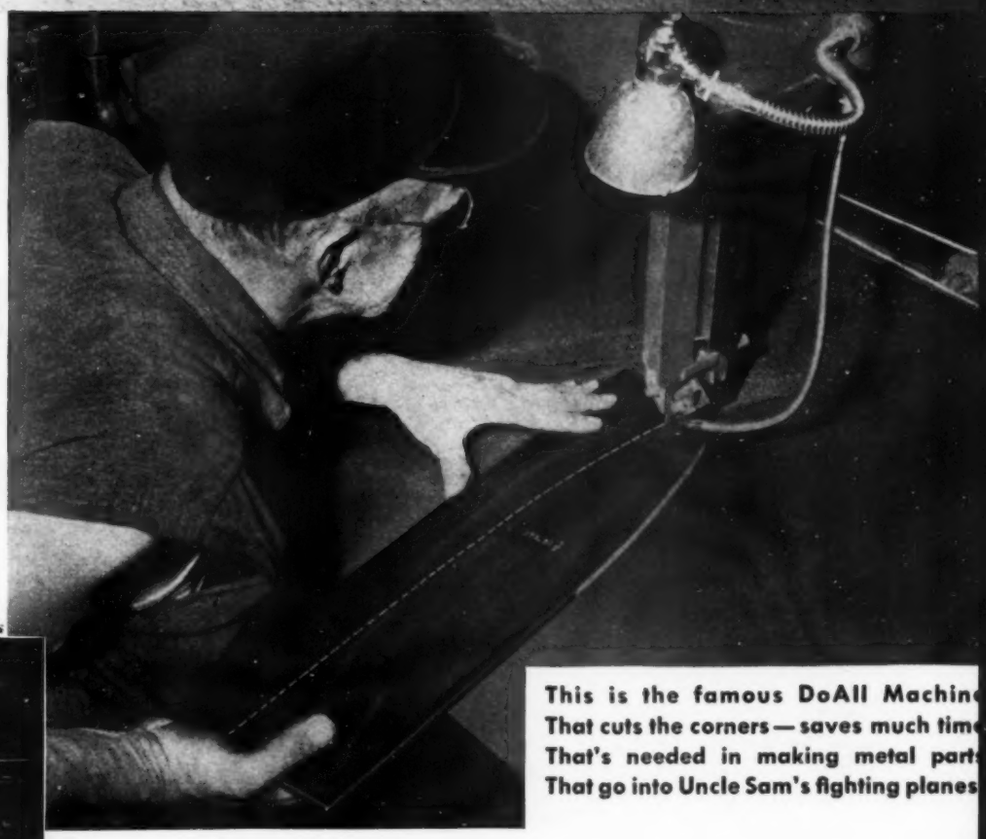
SHELL

☆ ☆ ☆ **WAR PRODUCTION SPEEDS AHEAD ON** ☆ ☆ ☆

SHELL INDUSTRIAL LUBRICANTS

DoAll SPEEDS PRODUCTION

OVER THE SEA
IN PLANES



This is the famous DoAll Machine
That cuts the corners — saves much time
That's needed in making metal parts
That go into Uncle Sam's fighting planes

Do All and the *THUNDERBOLT*

Views on this page are taken at one of the Republic Aviation Corporation's plants, where the sensational new *Thunderbolt* is being made. Dozens of DoAlls are sounding the all-clear-ahead signal by shaping and finishing parts in a fraction of former time.

Every plant where man-hour and man-energy savings are essential needs the DoAll. Every metal worker instantly recognizes the value of this modern production tool.

DoAlls range in price from $1,000 to $5,000 complete with necessary equipment; yet are relieving $10,000 to $50,000 machine tools of over-load work with valuable savings of time and metal.

Let us send a factory-trained man to your plant with a DoAll to show you what it can do and save for you.

NEW — Interesting and valuable book "DoAll on Production" free on request

*Fastest Precision Method of Removing Metal

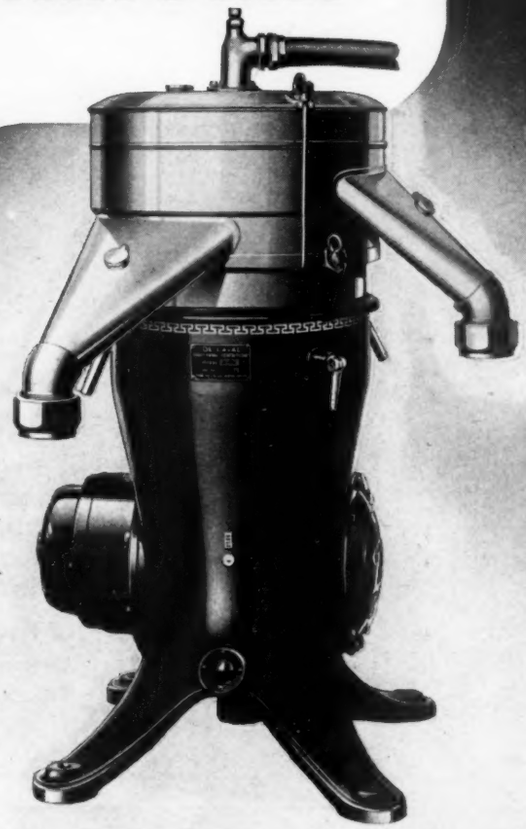
DoAll
Contour Sawing
BAND SAWING
BAND FILING
BAND POLISHING

CONTINENTAL MACHINES, INC.

1310 S. WASHINGTON AVE., MINNEAPOLIS, MINN.

Associated with the DoAll Company, Des Plaines, Ill., Manufacturers of Band Saws and Band Files for DoAll Contour Machines.

CONSERVE
TIME *and* MATERIALS
with
DE LAVAL CENTRIFUGALS



DE LAVAL centrifugal machines provide a simple, positive means of conserving liquids used in industrial processes. More than that, they speed up manufacturing operations and often improve the finished work by keeping such liquids as grinding coolant, cutting oil, etc., free from destructive foreign material . . . continuously remove impurities from lubricants used during the new machine run-in period.

De Laval Oil Purifiers find many important uses throughout industry: in power plants, steel mills, paper mills; in fact, wherever machines are lubricated from a central oil reservoir, De Lavals keep the lubricant clean and reduce wear on running parts, reduce maintenance costs and save oil.

A De Laval engineer will be glad to assist in solving your problem—without obligation, of course.

THE DE LAVAL SEPARATOR COMPANY
165 BROADWAY, NEW YORK 427 RANDOLPH ST., CHICAGO
DE LAVAL PACIFIC CO., 61 BEALE ST., SAN FRANCISCO
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

De Laval
CENTRIFUGAL PROCESSING SYSTEMS

You asked for it!

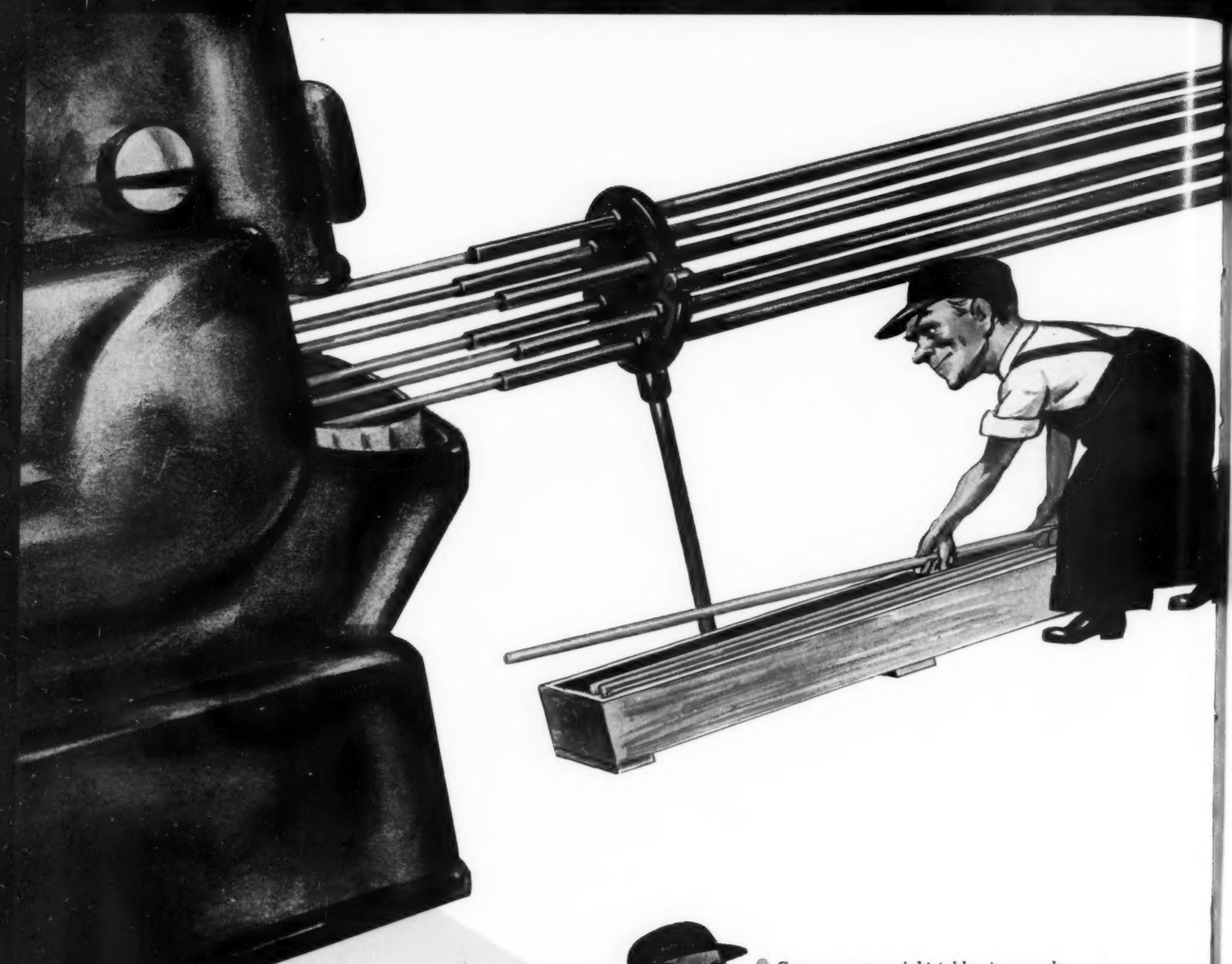
ANACONDA RODS
for screw machine products
LEADED, FREE CUTTING: BRASS • EVERDUR • PHOSPHOR BRONZE
HARDWARE BRONZE • COMMERCIAL BRONZE • NICKEL SILVER • COPPER
ANACONDA
THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut

So here it is—

A NEW publication on Anaconda Rods for screw machine use. Includes physical constants and properties on 16 leaded, free cutting copper alloy rods and 30 copper alloy general purpose and engineering rods. Also, convenient weight tables and conversion factors, machinability ratings, cost finding charts, and references to standard specifications. If you make, buy, sell or use screw machine parts of *any* material, you'll want this booklet—and it's yours for the asking.

ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut



● *Can you use weight tables in pounds per thousand pieces, in round and hexagon sizes from 1/16" to 1 1/4", in lengths from 1/16" to 1", including conversion factors for various alloys and shapes?*

● *Here are physical constants and properties, compositions and machinability ratings on 46 Anaconda Copper Alloy Free Cutting and General Purpose Rods.*

● *At your fingertips: A list of Standard Specifications for Anaconda Rods: Federal Army • Navy • A.S.T.M. S.A.E. • A.M.S. • A.S.M.E.*

ANACONDA
from mine to consumer

Anaconda Copper & Copper Alloys

Are those hungry screw machines on the right diet?

• THIS BOOKLET will help you decide which of these Anaconda Rods is the answer to this important question.

Anaconda Publication B-14 was prepared with a threefold purpose: First, to assist you in selecting the *one best rod* for the production facilities available for the job. • Second, to obtain the maximum in physical properties consistent with desirable free cutting characteristics. • And third, to provide the members of your Engineering Department with accurate, ready-reference data which will help speed up the task of meeting present-day production schedules. • This booklet is yours without cost. Simply fill in your name and address on the convenient form on the following page.

THE AMERICAN BRASS COMPANY
General Offices: Waterbury, Connecticut

ANACONDA COPPER ALLOY RODS

COPPERS
- Electrolytic Tough Pitch
- Deoxidized Copper
- Arsenical Copper—945
- Leaded Copper—946

BRASSES
- Commercial Bronze 90%
- Red Brass 85%
- Red Brass 80%
- Yellow Brass—61
- Muntz Metal

LEADED BRASSES
- Leaded Commercial Bronze—202
- Hardware Bronze—267
- Extruded Architectural Bronze—280
- Leaded Red Brass 80%—205
- Leaded Brass—211
- Butt Brass—229
- Free Cutting Yellow Brass—271
- Forging Brass—250

SPECIAL BRASSES
- Naval Brass—452
- *Tobin Bronze
- Manganese Bronze—937
- Leaded Naval Brass—612

PHOSPHOR BRONZES
- Phosphor Bronze 4%—903
- Phosphor Bronze 5%—351
- Leaded Phosphor Bronze 5%—979
- Phosphor Bronze 8%—353
- Phosphor Bronze 10%—354
- Special Free Cutting Phosphor Bronze—610
- Phosphor Bronze—314
- Phosphor Bronze—316

NICKEL SILVERS
- Extruded Leaded Nickel Silver 10%—823
- Leaded Nickel Silver 12%—796
- Leaded Nickel Silver 18%—789
- Nickel Silver 18%—719
- Nickel Silver 18%—723
- *Ambrac—850

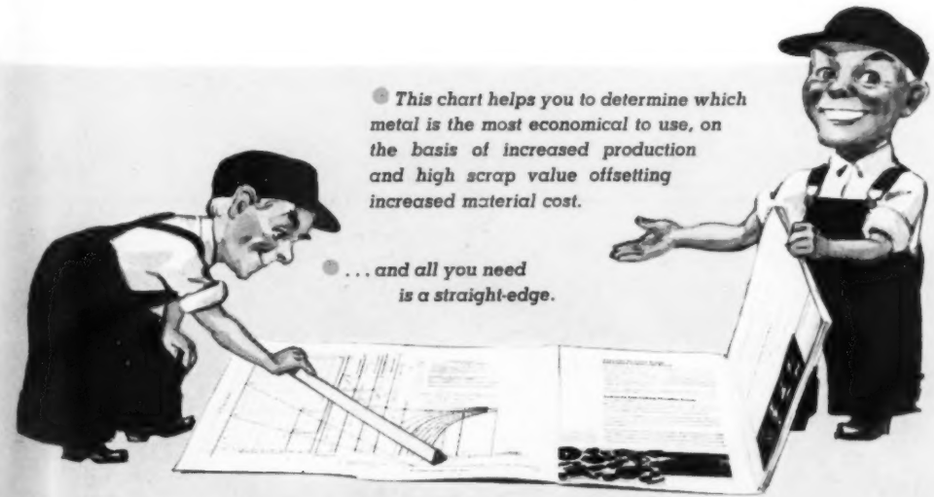
CUPRO NICKELS
- Cupro Nickel 15%—736
- Super Nickel—701

ALUMINUM BRONZES
- Ambraloy—901
- Ambraloy—928
- *Avialite—915
- Ambraloy—917

COPPER-SILICON ALLOYS
- *Everdur—1010
- Everdur—1012
- Everdur—1015

BERYLLIUM COPPER—175

CHROMIUM COPPER—999


• This chart helps you to determine which metal is the most economical to use, on the basis of increased production and high scrap value offsetting increased material cost.
• . . . and all you need is a straight-edge.

*Trade-Marks Registered United States Patent Office

Made by The American Brass Company

Short Cuts to Low Costs with Anaconda Special Shapes

Today, time is worth more than money. You can save both by using Anaconda Special Shapes. These shapes, available in long mill lengths, are suitable for use in screw machines and eliminate the need of expensive and time-consuming milling or other machining operations. Pinions, cams and irregular sections of many kinds can be produced by either cold drawing or extruding copper and nearly all of its alloys, including brass, nickel silver, phosphor bronze, etc. Anaconda Special Shapes, along with 46 other copper alloy rods, are described in this new booklet, "Anaconda Free Cutting Brass Rods." To get your copy, simply fill out and mail the form below.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut • *Offices and Agencies in Principal Cities*
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

ANACONDA
from mine to consumer

A Request for Anaconda Publication B-14, 4th Edition

"Anaconda Free Cutting Brass Rods"

Print your name and address and mail to: The American Brass Company, General Offices, Waterbury, Connecticut

NAME..... COMPANY.....

STREET..... CITY and STATE.....

42101AM

HOUGHTON'S HYDRAULIC OILS REMAIN STABLE!

HERE'S WHY:

They protect your machines for longer periods against trouble arising from chemical changes in the oil in service. Their high demulsibility and low oxidation rate mean minimum absorption of moisture . . . . hence, no acid . . . . no foaming . . . . no sludging . . . . no sticky deposits on valves. These stable oils assure top performance of hydraulically operated machines without quiver or chatter in the system. Houghton's Hydraulic Oils are standard in America's greatest munition plants. Install them in your machines and you can forget your hydraulic oil problem "for the duration."

FIVE "MUSTS"
FOR A HYDRAULIC OIL

1. Must serve long periods without need of change.
2. Must be free from foaming tendencies.
3. Must have a high viscosity index.
4. Must minimize gumming or carbon formation.
5. Must be non-corrosive.

. . . and Houghton's Oils have 'em all!

E. F. HOUGHTON & CO.
Chicago ★ PHILADELPHIA ★ Detroit

HOUGHTON'S HYDRAULIC OILS

IN TIMES LIKE THESE,
the best oil you can buy
IS THE ONLY GOOD ONE!

Simplification and S

IN SPECIFYING AND BUYING YO

1 BUY "STANDARD" HEADED AND THREADED PRODUCTS INSTEAD OF "SPECIALS"

it's being done!

2 USE HEAT TREATED CARBON STEEL INSTEAD OF SCARCER ALLOY STEELS

it's being done!

3 RE-CHECK YOUR SPECIFICATIONS AND SAVE STEEL BY USING SMALLER BOLTS

it's being done!

FIVE BIG PLANTS—*At Cleveland and Kent, Ohio; Chicago and Birmingham*

Standardization

YOUR BOLT AND NUT REQUIREMENTS

● As in all other products made from steel, there is a "bottle-neck" in delivery of *bolts and nuts* to industry. It is caused by the tremendous volume requirements and the variety of specifications as to *types of materials, methods of manufacture* and *design* of the fastenings themselves. It is the purpose of this advertisement to point out a means of relief—that will expedite deliveries, that will speed up production of much needed war materials.

Find out from us, or any other responsible bolt manufacturer, if you can possibly use a *standard* product instead of a specially designed fastening. By "standard" we mean a product which is standard in the bolt manufacturing industry and for which there are standard specifications, *and of course,* existing tools and dies.

Frequently through unfamiliarity with the engineering progress made in the bolt industry, designers will specify a bolt made of a special analysis steel of a special size and shape although they could get a *standard* carbon steel bolt properly heat treated that actually might be *equal or superior* to the special bolt they specified!

We know that some engineering designs are based upon obsolete data showing Cap Screw strength at 60,000—65,000 lb. psi, whereas Lamson *standard* automotive Cap Screws are manufactured with a minimum tensile strength up to 150,000 lb. psi in diameters up to ½-inch; up to 125,000 lb. psi up to and including ⅝-inch; and up to 115,000 lb. psi in larger diameters. Very often a smaller bolt can be used than is specified provided a heat treated carbon steel bolt is considered. This means less material is needed in the bolt itself, less material has to be removed from the parts bolted together, and a lower cost and better delivery is possible.

Check with our engineers on comparative utility of a *standard* fastening with your special headed and threaded part. You may avoid the delays and headaches associated with demanding an alloy on the "critical list" of scarce materials, which you may not actually need at all. Our engineering department is composed of trained technicians; the most complete chemical, physical and metallurgical laboratories in the bolt industry are at your disposal here.

Remember that a mill order for a million pieces of a *standard* bolt may go through our factories in one continuous stream, eventually to be split up among a dozen customers—but all of whom will get precisely the same, *standard,* interchangeable product.

Tools and dies for making *standard* products are always available and ready, whereas special tools for "specials" mean use of critical tool steel and every tool room is loaded to the limit right now.

Standard bolts require no specialized processing or inspection, and no more than customary shop and engineering supervision — whereas "specials" must necessarily pass through our production with specialized, individual attention as an individual order.

From every point of view the time element is reduced in every step of production of a *standard* product as compared with a "special," from inspection of raw material to final packing for shipment. And, of course, in servicing an assembly in the field, replacements of *standard* bolts are always readily available.

For engineering counsel call on Lamson & Sessions' engineers. Remember, they are *specialists in bolt manufacture* and can help you. Where only a "special" can serve your purposes, they can give you sound guidance in its specifications—real help in getting it into production. Just ask for a Lamson engineer to call.

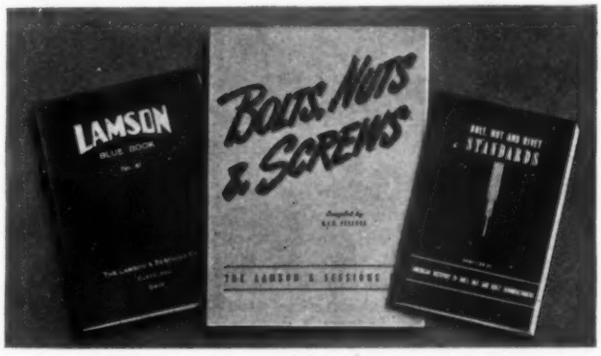
●

These three books will help you in specifying and buying standard bolts and "specials"

The Lamson Blue Book—our complete catalog of *standard* products excepting our aircraft products.

"Bolts, Nuts and Screws"—70 pages of technical and practical information. First copy gratis if requested on your letterhead; additional copies *one dollar each.*

"Bolt, Nut and Rivet Standards"—175-page book published by the American Institute of Bolt, Nut & Rivet Manufacturers, 1550 Hanna Bldg., Cleveland, Ohio; Price *one dollar* per copy. (Order from the publishers, please.)



★ ***BUY U. S. DEFENSE BONDS*** ★

THE LAMSON & SESSIONS COMPANY • 1971 West 85th Street • Cleveland, Ohio
Plants at Cleveland and Kent, Ohio; Chicago and Birmingham

LAMSON & SESSIONS

BOLTS · · NUTS · · COTTERS · · CAP SCREWS · · SPECIALS

Your Jobber Stocks the Lamson Line

ONE

Steel-Hardening Process Stands Out in this Emergency

CHAPMANIZING

"Times and conditions often select a great leader". And that's what has happened in the metal-working industry, where the searching tests of war requirements have singled out a process for surface-hardening steels . . . the quick, inexpensive and super-durable process long known as Chapmanizing.

Chapmanizing gives steel parts a tough yet ductile case from .002" to .035" deep . . . in 1 to 4 hours of hardening time. Chapmanizing turns out parts that are silver-clean, free from soft spots, with a wear-resistant surface that won't chip, warp, distort or corrode under bending, abrasion or sliding pressure. And Chapmanizing gives free-machining steels the wearing qualities of scarce and costly alloys, where specifications permit substitution.

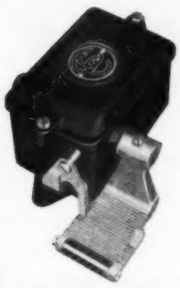
And if *your* specifications permit, it can be arranged for you to ship any material either to the Chapman plant or the nearest Chapman licensee . . . and get the full benefits of this modern hardening process. Write to the Metallurgical Sales Division of:

THE

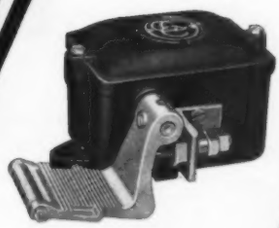
CHAPMAN VALVE

MANUFACTURING CO.

Indian Orchard, Mass.



TYPE FSL 11, FSL 22, FSL 33
FOOT SWITCH WITH LATCH



TYPE FWS 22
WITH STOP FOOT SWITCH

TYPE FWLS 22 LATCHING
POSITIONED FOOT SWITCH

TYPE FRS 22 DOUBLE
PEDAL FOOT SWITCH

TYPE FS 44
4 POLE FOOT SWITCH

As part of the "3C" share toward "V for Victory", the above Bulletin 101 Heavy Duty Foot Operated Master Switches are offered for Mill and Industrial Service.

Furnished with or without latch, Right or Left Pedal, Dust Tight (NEMA IC 50-28), Water Tight (NEMA IC50-43) with Moving Finger Mechanism interchangeable on all Types, these switches are adaptable to a wide variety of applications.

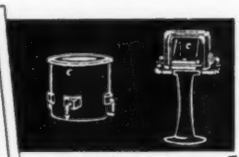
In hundreds of plants engaged in production of Defense materiel, "3C" Foot Switches are providing dependable low-maintenance Service. A fully descriptive Bulletin 101 is yours for the asking.

CONTINUE TO ROLL WITH CLARK CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

New JOHNSON Furnace ON THE OFFENSE



Burning for

VICTORY

No. 820 TEMPERING and DRAWING FURNACE

A new Johnson Furnace that will carry on the Johnson tradition of producing the best for less! Use it for speedy tempering of tools, dies, small parts, non-ferrous castings and parts, for heating aluminum forgings and rivets, and any other job requiring a temperature range from 275 to 1200° F. It's an ideal production furnace, occupying small space and easily moved.

Ruggedly constructed, and heavily lined with insulating refractory. Equipped with two large Johnson atmospheric burners, counterbalanced, self-aligned, well insulated door (controlled by crank), and 2 Allegheny metal shelves. Due to superior construction, No. 820 is most economical to operate, and gives remarkably even heat thruout the combustion chamber. Firebox: 14" high, 16" wide, 16" deep. Available with automatic temperature control. Write for prices NOW!

JOHNSON FURNACES for INDUSTRY

FOR MORE THAN 40 YEARS

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"PUSH-BUTTON" positioning for many welds

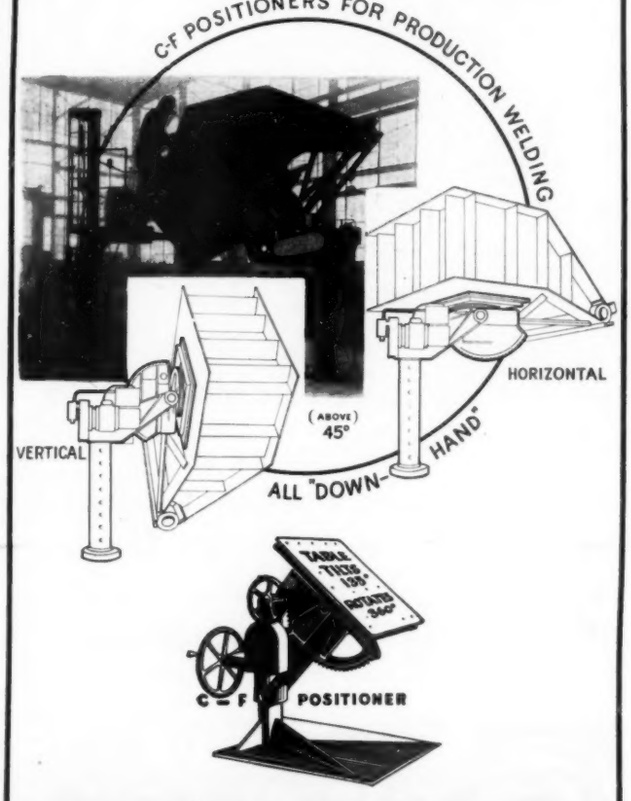
Fabricating assemblies of this size and shape requires many welds. Push button positioning on a C-F Positioner saves time and effort. Crane service is cut down, actual welding time is increased, accident hazard is decreased and better, "down-hand" welds may be had at every point. Jig up and weld your work this modern way for faster production, for more economical welding.

C-F Positioners are available in hand operated or power driven machines with capacities from 1200 to 14,000 lbs.

Our bulletin W P 20 will give you the facts. It is illustrated, interesting and free upon request.

CULLEN-FRIESTEDT CO.

1313 S. Kilbourn Ave. Chicago, Illinois



CULLEN-FRIESTEDT CO.,
1313 S. KILBOURN AVE. CHICAGO, ILLINOIS

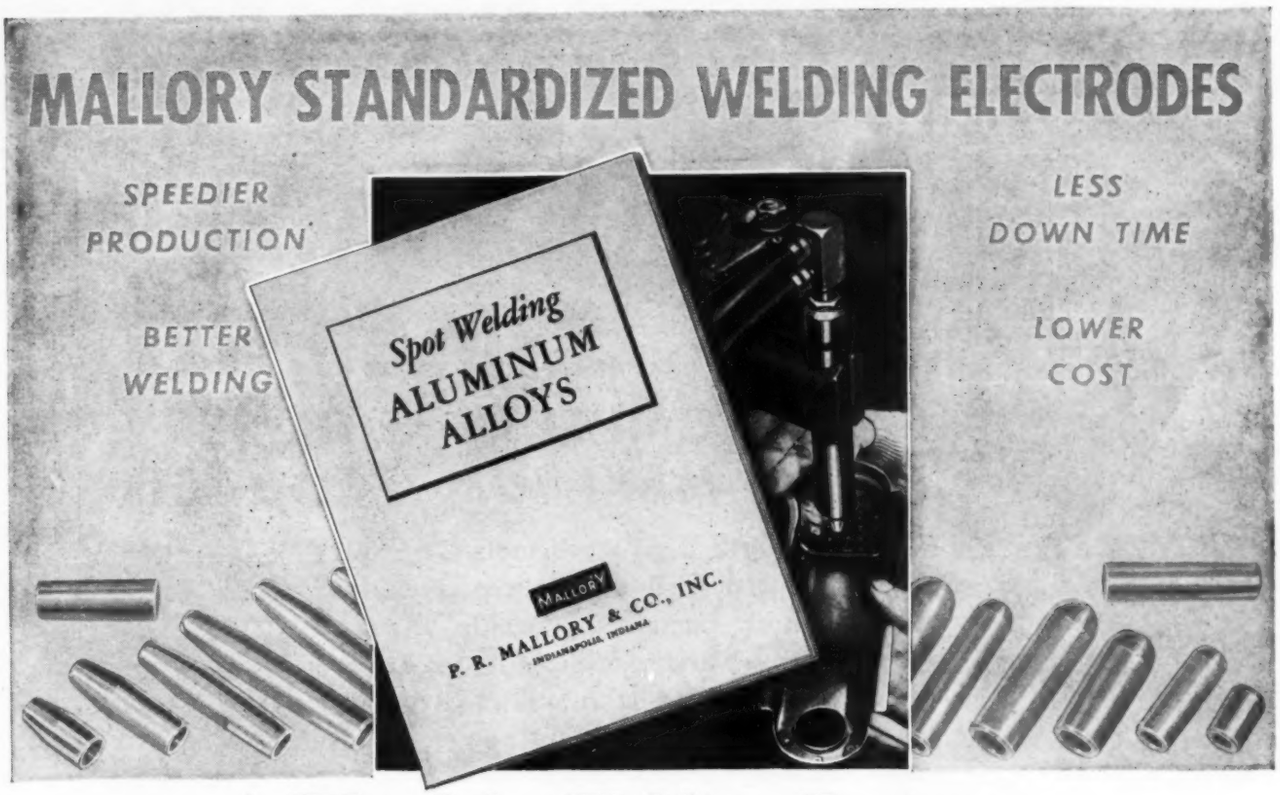
MALLORY STANDARDIZED WELDING ELECTRODES

SPEEDIER PRODUCTION

BETTER WELDING

LESS DOWN TIME

LOWER COST



A "Must" for Welding Engineers

Just off the press . . . diagrams, graphs, tables and descriptions of resistance welding machines, electrodes, and spot welded joints . . . as applicable to *aluminum* and its alloys. If you haven't a copy of the new Mallory technical booklet, "Spot Welding Aluminum Alloys", write us for one or more copies today.

Whether or not you're actually spot welding aluminum at present, you'll want this terse, factual 12-page treatise at your elbow for handy reference. Here are some highlights:

- Spot welding characteristics of aluminum and its alloys . . . with comparative values for other metals. Tabular data and discussion.
- Spot welding equipment for aluminum alloys. Diagrams and descriptive data on
  - a. Welding machines
    1. Magnetic Storage Welders
    2. Condenser Storage Welders
    3. Rectified Three Phase Welder
    4. Standard A.C. Welders
  - b. Electrodes
    1. Materials
    2. Design
    3. Electrode Holders and Cooling
- Design of spot welded joints. Diagrams, tabular data, graphs and discussion.
- Aluminum welding technique. Graphs, tables and discussion relative to the four types of welding machines listed above.

Why not take a moment *now* to write for your free copy of "Spot Welding Aluminum Alloys"? It's the supplement you need for that other "must" in your technical library . . . the 79-page Mallory Resistance Welding Data Book . . . recognized as one of the best handbooks in the welding industry.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA • *Cable Address*—PELMALLO

RESISTANCE WELDING P. R. MALLORY & CO. Inc. MALLORY **STANDARDIZED ELECTRODES**

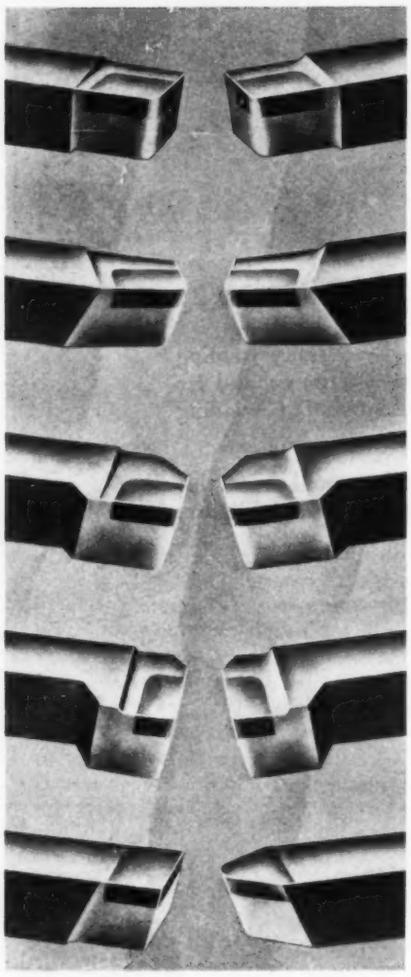
STANDARD STOCK TOOLS
Finished Ground

METHOD **1**

Vascoloy RAMET

T M REG U. S. PAT OFF

5-METHOD
COMPLETE TOOL SERVICE *for* MAXIMUM PRODUCTION



These standard stock tools are available with a choice of three grades of Ramet Cemented Carbide Blanks. With a variety of sizes in ten styles there are 164 standard tools in all.

Vascoloy-Ramet Standard Tools are finished ground ready to use. You can also regrind any of them to obtain different cutting angles to suit particular cutting conditions. The generous size of the blanks permits the modification of these tools to meet many special or form tool requirements. With the three grades and the many sizes and styles, these standard tools will take care of the majority of all the turning, boring and facing operations on steel, cast iron, and abrasive materials.

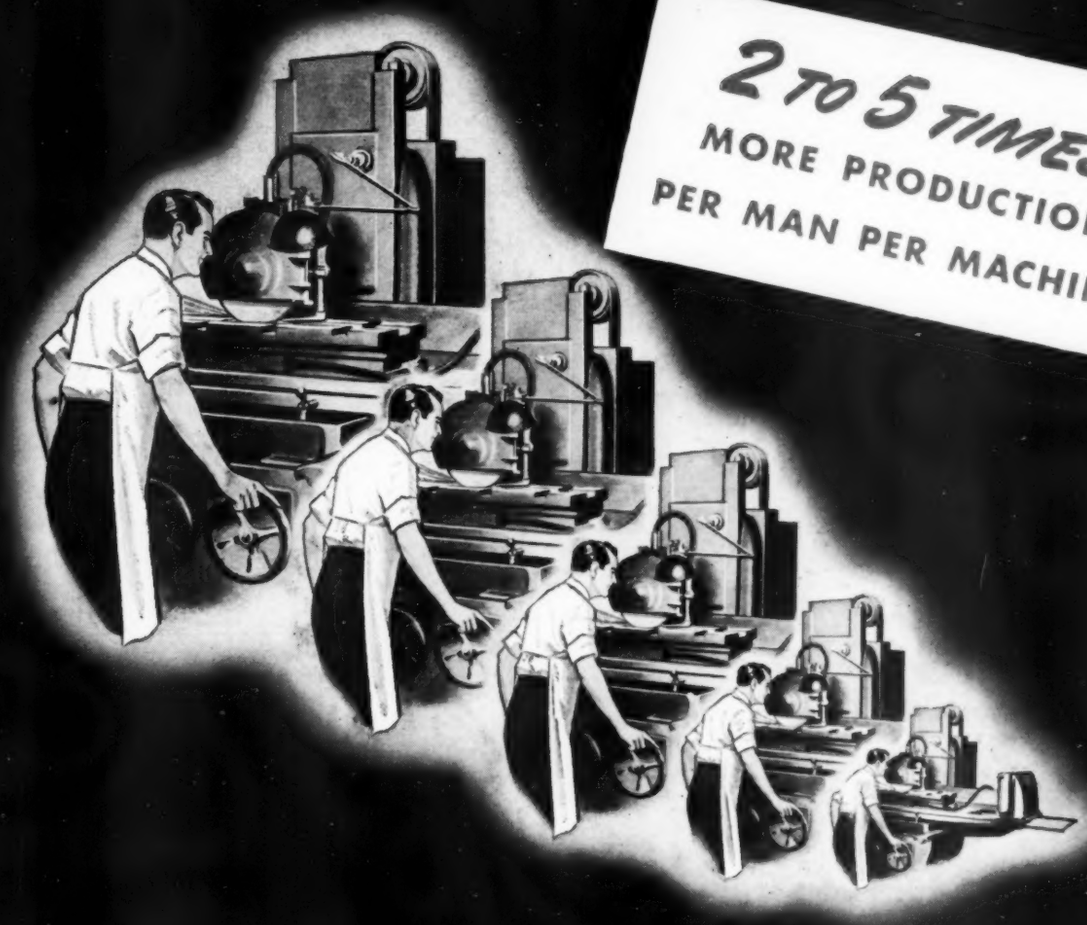
Full particulars on all Vascoloy-Ramet Standard Tools and Blanks are contained in the new catalog and price list VR-421. Write for your copy.

Prompt Delivery
on Standard Tools and Blanks

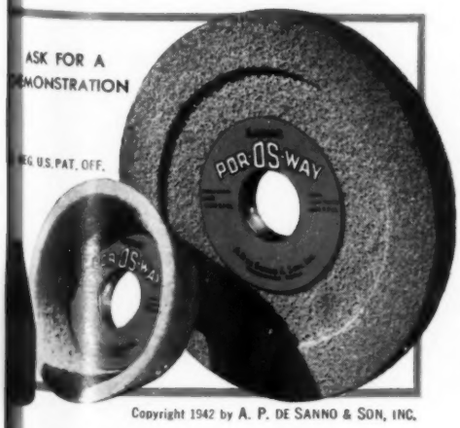
4216

VASCOLOY-RAMET CORPORATION
NORTH CHICAGO, ILLINOIS
DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES
IN CANADA: Carbide Tool & Die Company, Ltd., Hamilton, Ont.

THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE TOOLS



A new Grinding Wheel that practically eliminates an old bugaboo called "burning"



Copyright 1942 by A. P. DE SANNO & SON, INC.

ONCE IN A WHILE a development comes along that knocks old ideas into a cocked hat. That has just happened to grinding wheels. A new wheel, named Por-os-way, is taking cuts you never dreamed of before, stepping up production per man per machine 2 to 5 times and practically eliminating burns.

The success of the Por-os-way wheel is the result of an entirely new structure. The Por-os-way wheel has millions of air cells that cool each grinding point. Yet the wheel—for all its porosity—is tough and strong due to a new vitrified bond and a "stringy" texture produced by an exclusive patented process. You can see the difference easily with your naked eye but you'll have to try Por-os-way to believe how much faster, cooler and free cutting it works, how it holds its corner, and how little dressing it requires.

Try the Por-os-way wheel on hardened tool and die steels, and on softer materials such as tin, aluminum, copper, wood, rubber and plastics. Write today for a trial demonstration. A. P. DE SANNO & SON, INC., 430 Wheatland Street, PHOENIXVILLE, PENNSYLVANIA.

POR-OS-WAY* *a new* **RADIAC* PRODUCT**

(TURN PAGE, PLEASE)

A NEW GRINDING WHEEL THAT IS

8 WAYS BETTER

The new Por-os-way wheel in actual production tests has removed stock 100 to 400% faster than ordinary wheels.

Por-os-way resists loading on hardened tool and die steels and softer materials such as aluminum, copper, plastics and tin.

The structure of the Por-os-way wheel is cool, porous, made by a new, patented process which required 3 years to perfect.

Por-os-way boosts production 2 to 5 times per man per machine. It helps to solve shortages in labor and machines.

Because of a tough new vitrified bond the Por-os-way wheel holds its corner and requires only a minimum of dressing.

Cool cutting action, minimum dressing enable Por-os-way to outlast other wheels and reduce number of wheel changes.

The Por-os-way wheel costs more but repeated checks show that, properly operated, it is worth many times its extra cost.

Aerated structure of Por-os-way wheel cools each tiny grinding point between contacts, virtually eliminates "burns"

A. P. de Sanno & Son, Inc.,
430 Wheatland Street, Phoenixville, Penna.

I'm interested in knowing more about the Por-os-way Grinding Wheel. Please send me descriptive folder.

*Name*_____

*Company*_____

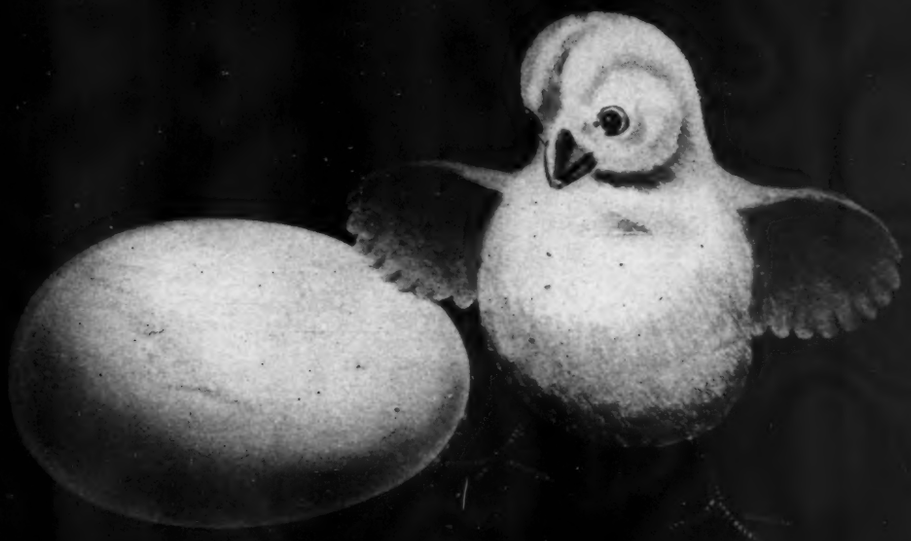
*Position*_____

*Street*_____

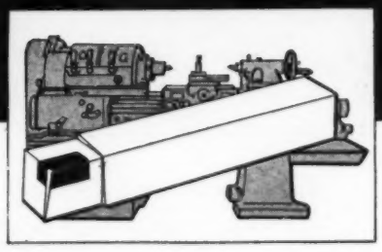
*City*_____ *State*_____

POR-OS-WAY* *a new* **RADIAC* PRODUCT**

A. P. de Sanno & Son, Inc., Phoenixville, Pennsylvania · Since 1[illegible]
Offices and Warehouses in Pittsburgh, Cleveland, Detroit, Chicago, Los Angeles



WHICH CAME FIRST?



CUTTING TOOL? **MACHINE TOOL?**

The answer is easy when applied to the cutting tool vs. the machine tool.

The Cutting Tool always comes *first*—of necessity! Major advances in cutting tools lead to new designs of machine tools.

On new cutting jobs, the selection of the machine tools depends on the kind of Cutting Material to be used.

For example, you must first make a choice between high-speed steel, super high-speed steel, and a sintered carbide like Firthite. We are makers of all these cutting materials:

STAR-MO, "Moly" High Speed Steel
BLUE CHIP 18-4-1 High Speed Steel
CIRCLE C Super High Speed Steel
FIRTHITE Sintered Carbide

Our engineers will be glad to help you find the best type for every job.

FIRTH-STERLING
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OFFICE AND WORKS:
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CLEVELAND DETROIT

We Serve You by Serving National Defense

Today with all of the production facilities we have working at top speed to serve the cause of National Defense we must, of necessity, slight some of our old friends in industry who are makers of consumer goods and equipment. It's like having only one apple to fill four waiting hands.

But we feel and we hope our friends know that we are serving them best by concentrating our efforts on making forged parts for ships, planes, guns, tanks and other urgently needed weapons of offense and defense.

Industry built Kropp Forge and it is our hope that soon we can again take care of the requirements of industry.

Today, then, we are fulfilling our patriotic duty—*we serve you by serving National Defense!* Tomorrow we will welcome the opportunity of serving you.

KROPP FORGE COMPANY

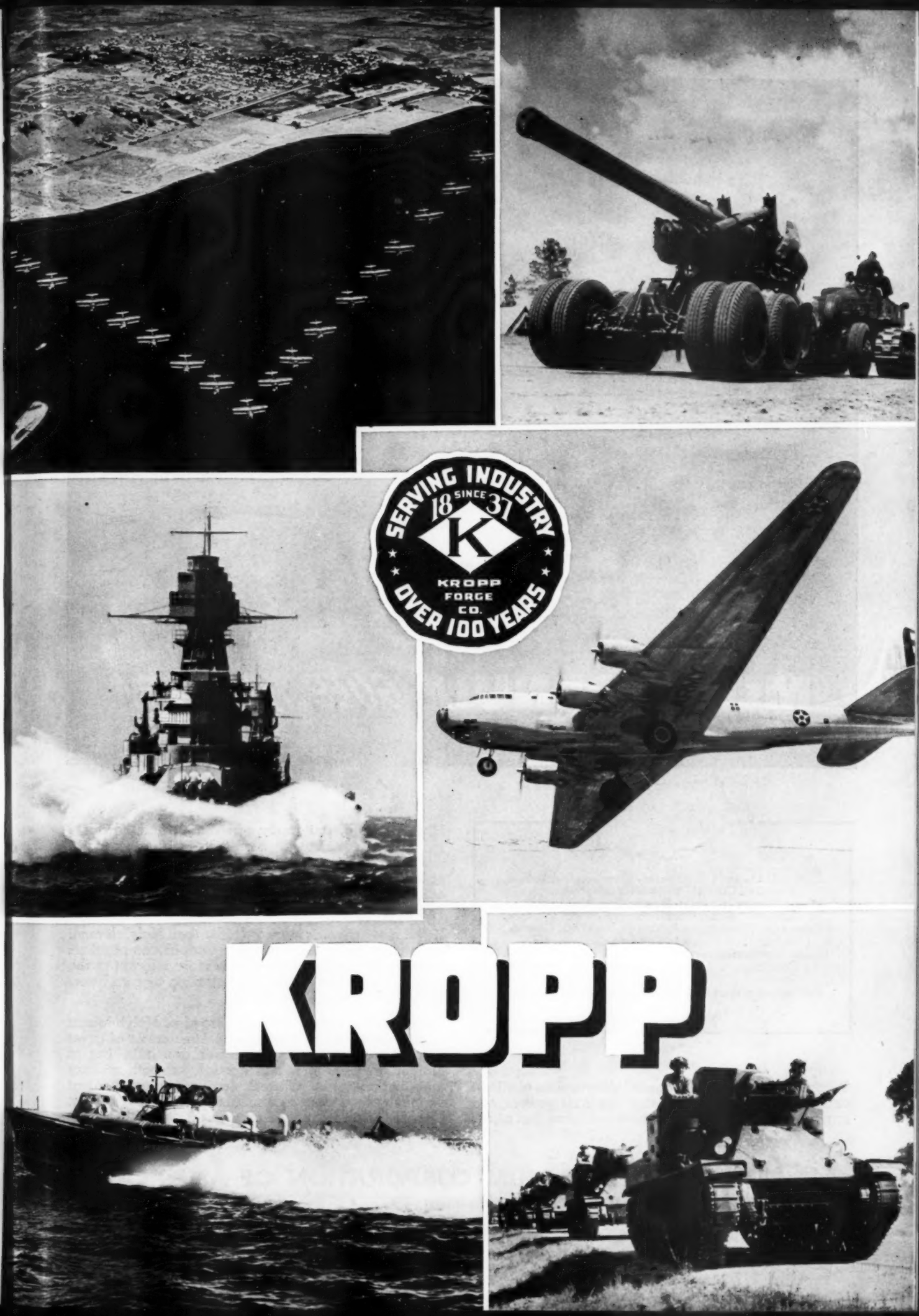
World's Largest Job Forging Shop

5301 West Roosevelt Road, Chicago, Illinois

Representatives in Principal Cities

The United States Navy Bureau of Ordnance Flag and Navy "E" Pennant for *Excellence*, rarely awarded material suppliers, flies high at the mast at our plant. We are proud of this recognition of our efforts.

Picture at left of opposite page—*official U. S. Navy Photographs;* at right, *Douglas Aircraft* and commercial releases.


SERVING INDUSTRY
18 SINCE 31
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KROPP
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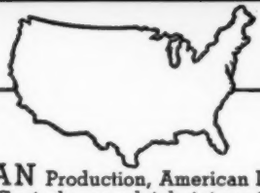
OVER 100 YEARS
KROPP

MOLYBDENUM *GOES TO WAR!*



AMERICAN Production, American Distribution, American Control—completely integrated.
Mines: Tucson, Arizona; Questa, New Mexico.
Smelting and Refining Works: York, Pa., Washington, Pa.
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Sales Representatives: Edgar L. Fink, Detroit; H. C. Donaldson & Co., Los Angeles, San Francisco, Seattle.
Ample stocks, sales facilities, technical advice available.

Wherever American steel goes into weapons of attack or into defensive armor against the Axis powers, the importance of Molybdenum increases more and more.

High strength, uniformity of strength and hardness in irregular sections, high-temperature strength, machinability with high strength and high degrees of hardness—materials with such properties are the assurance of victory on land or sea or in the air. "Alloys will win the war."

No alloying agent is more versatile than Molybdenum, none more easily introduced in various compositions for various needs. And none is more tolerant in the presence of other elements, conferring its own benefits without diminishing theirs.

In the United States, and nowhere else, Molybdenum is abundant. Some metallurgical materials of great value become scarce under war demands, but of Molybdenum there is still enough for both military and civilian uses. Correct advice and convenient supplies are offered to any American manufacturer. Literature will be mailed on request.

MCA

MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING, PITTSBURGH, PA.

"Welding would bank $2100 for me here"

What can I learn from this peace-time product to guide me in making plans for the post-war Battle for Business?

ALTER EGO: Well, the first big lesson is that the manufacturer points out that if this $900 car were built by the non-welding methods of 15 years ago, the cost would run $3000.

That's a saving of $2100 by welding and mass production. Could it be possible for me to apply the same method to my product to cut costs and boost volume for the tough years ahead?

ALTER EGO: You know there is a simple *plan* for changing over to welding, like that of the auto builders:

(1) Appoint a man of experience and give him authority to supervise welding developments.

(2) Change one part at a time, starting with the simple levers, brackets, etc.

That sounds familiar. Doesn't The Lincoln Electric Company of Cleveland, Ohio, GUARANTEE that you'll profit from a plan like that? Why not write them for suggestions for changing over?

ALTER EGO: Literally, "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

Thousands of Machine Gun Parts

HEAT TREATED IN THIS BATTERY OF MODERN SC *CHAR-MO FURNACES

● SC Standard Furnaces utilizing Char-Mo atmospheres are adding to the strength and durability of vital parts for machine guns in this war materials plant. These small machine gun parts are of high carbon and nickel alloy steels. They are charged on small trays heated to and held at proper heat treating temperatures, for the required period of time. Following the heat treatment, the trays are removed and the parts are oil-quenched in tanks beside each furnace. The process results in parts that have been clean-hardened without scale or decarburization.

SC Char-Mo Furnaces are a popular choice of heat treaters due to the great flexibility of use for any heat treat application requiring special atmospheres, including hardening of high speed tool steels. SC Bulletin CM-41 gives complete sizes, specifications and operating data. Write for it.

SURFACE COMBUSTION • TOLEDO, OHIO

"SECURITY FOR AMERICA" SC

SURFACE COMBUSTION

MANUFACTURERS OF INDUSTRIAL FURNACES · JANITROL GAS-FIRED SPACE HEATING EQUIPMENT · AND KATHABAR AIR CONDITIONING SYSTEMS

McCASKEY TOOL CRIB CONTROL

quickly and easily installed—employees prefer it

*MORE PRODUCTION WITH **LESS TOOLS

* IMPERATIVE FOR MULTI-SHIFT OPERATION

McCaskey Tool Crib Control—by cutting the time required for drawing and returning tools—puts men and tools at *productive* work in a fraction of the time with checks and other systems. Multi-shift operation multiplies the demands on the tool crib. Tool service must be stepped-up to the increased pace of the plant. Tools must be available in good condition without the least delay. Lost time—and resulting lost production—of men and machines must be prevented.

Actual experience in numerous plants, large and small, is proving daily that better and faster service at tool crib windows with McCaskey Control has materially increased their production under the most severe conditions.

* * THREE SHIFT OPERATION WITH FEWER TOOLS

At the same time, the difficulty of providing sufficient tool inventory for multi-shift requirements is reduced by McCaskey. Tools not in actual use are returned promptly to tool cribs where they immediately are available for the next job. McCaskey records, totally visible at a glance, prevent the accumulation of tools at machines or in tool boxes—enable inexperienced crib operators to enforce economical use of available inventory.

Tool turnover or usage records, quickly secured, frequently reveal a surplus of important items that are difficult to secure today and indicate inactive items that may be salvaged for essential operations. Tool breakage is reduced as much as 50% and loss and theft are practically eliminated. McCaskey assures "more production with less tools"!

McCaskey Tool Crib Control can be installed to meet your particular requirements quickly and easily without the least interruption of production. Write us *today* for complete reports of results secured in several nationally-known plants. McCaskey representatives are available to render valuable assistance. No service fee. No obligations.

NON-PRODUCTIVE TIME ELIMINATED The tool supervisor of a large brass company reports: "The adoption of McCaskey has eliminated the costly non-productive time frequently wasted by both men and machines, while missing tools were located .... savings have repaid our investment many times over."

MAINTAINING SUFFICIENT STOCK FOR TOP REQUIREMENTS MORE evidence from a plant operating three shifts: "The (McCaskey) Control also provides a monthly turnover record for each tool that indicates the tools and the quantities of each to be reordered. The data is easily secured and it removes all guesswork from this important job. As a result, our *inventory has been substantially cut* but we know that we are carrying *sufficient stock for our top requirements.*"

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems, Ltd., Galt, Ontario, Canada. The McCaskey Register Co., Watford, England.

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

Fortunate are the textile knitting mills, hard-pressed for production, who are equipped with Mazlo Magnesium sectional warp beams. Like other manufacturers who, before the war, had the foresight to employ this lightest of lightweight metals, they are now operating more efficiently because of the advantages obtained. Production is higher.

Mazlo Magnesium warp beams are very light in weight. Stops and starts on the machines are smoother, resulting in fewer breaks of the yarn. The job goes faster wherever empty or full beams must be handled; less fatigue for workers. These beams run true—they are strong and rigid—so yarn goes on evenly and comes off that way; finer finished fabrics.

This is another example of before-Defense planning which is profiting all of us today. Why don't you "design ahead" for the day when there will be an abundance of Magnesium for all uses? We'll gladly assist you. Sales Agent for Mazlo Magnesium Products: Aluminum Company of America, 1709 Gulf Building, Pittsburgh, Pennsylvania.

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

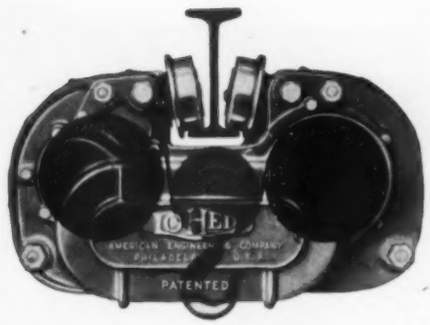
MAZLO MAGNESIUM PRODUCTS

AMERICAN ENGINEERING COMPANY

The Lo-Hed Hoist Is Applicable To Any Monorail System
There's A Balanced Lo-Hed Electric Hoist For Every Purpose

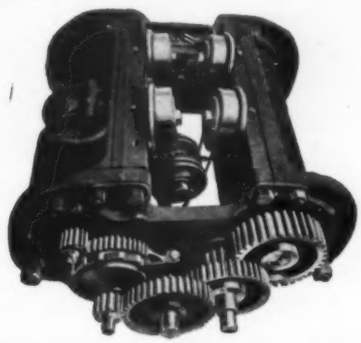
OTHER A-E-CO PRODUCTS: TAYLOR STOKERS, MARINE DECK AUXILIARIES, HELE-SHAW FLUID POWER

Look in your Classified Telephone Directory under "A-E-CO LO-HED HOISTS" for your nearest representative.



WATCH FOR BALANCE IN HOISTS

LO-HED, the *Balanced* Hoist. You can identify a Lo-Hed Hoist a "mile away". Many have said just that. And it's true. A Lo-Hed Hoist looks distinctly different from any other hoist—because it is different. The difference begins with the arrangement of the motor and drum. See how they are arranged around the beam! This unusual construction permits the use of efficient spur gearing, easily removable covers. You also get minimum headroom, a valuable plus advantage if hoists are to be used now or later under low headroom conditions. Write for Lo-Hed catalog today.



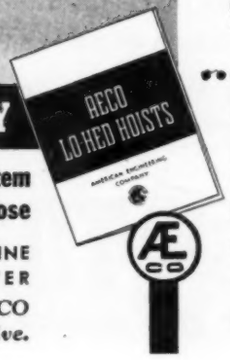
LOOK AT THE BALANCED LO-HED!

It Costs Less To Operate—All gears are efficient stub-tooth spur gears running in a sealed oil bath . . . gear shafts and trolley wheels are equipped with heavy-duty ball or roller bearings.

It Costs Less To Maintain—Sturdy construction . . . seldom, if ever, requires removal from rail . . . covers of controller, motor, drum and gearing are easily removed.

It's Safe—Factor of safety of over 5 at full capacity . . . 100% Positive Automatic Stop when load reaches upper limit . . . Automatic Holding Brake prevents load from drifting when current is shut off . . . short, strong shafts minimize torsional stresses.

It's Protected—Controller is fire, dust and moisture proof . . . motor totally enclosed . . . gearing sealed in . . . motor and drum covered by easily removable covers.



AMERICAN ENGINEERING COMPANY
2407 Aramingo Avenue, Philadelphia

☐ Please send me your complete catalog of LO-HED HOISTS.
☐ Ask your representative to get in touch with me promptly.

Name_____

Company_____

Street Address_____

City_____ State_____

(Please print plainly)

Everywhere... SKILSAW TOOLS are at the Front in the Battle of Production!

Skilsaw Disc Sanders—6 Models. Speed up all sanding, grinding, filing, metal cleaning and polishing on flat or curved surfaces of wood, metal, compositions.

Skilsaw Belt Sanders—4 Models. Finish *faster—smoother* on wood, metal, stone or compositions. Ideal for every job from coarsest sanding to finest honing.

Skilsaws—9 Models. Speed up all sawing. Save time in plant expansion, remodeling, maintenance. Cut flat or corrugated metals in production.

Skilsaw Drills—23 Models. More drilling power—more holes per hour. Speed up all drilling from lightest production work to heaviest boring and reaming.

Wherever the fight for production is fiercest—wherever war materials are being built fastest you'll find SKILSAW TOOLS at work . . . speeding up jobs in every industry . . . making each man, each minute more productive . . . saving days and dollars for quicker Victory!

SKILSAW TOOLS are rugged, reliable, powerful. They work faster, handle easier and do more kinds of jobs. That's why they're preferred so widely in plants making aircraft, tanks and other war materials. That's why they belong in your plant, too, to build *fast* what America needs right now! Ask for a demonstration of SKILSAW TOOLS.

SKILSAW, INC., 5059 Elston Avenue, Chicago

New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit • Indianapolis • St. Louis
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SKILSAW PORTABLE ELECTRIC TOOLS

★ *FOR THE DEFENSE OF AMERICA* ★

SYMBOL OF DEPENDABLE PERFORMANCE IN TOOL STEELS

Coppco water hardening (gray label) and oil hardening (black label) tool steels have been developed from the long experience of our metallurgical engineers and their familiarity with the users' requirements.

"COPPCO .75"

WATER HARDENING GRAY LABEL

Hardens to give greater toughness than Coppco Universal or Coppco 1.10. *Used for:* Shock tools · Extra Large Shear Blades · Swages · Button Sets · Drift Pins · Cold Chisels · Large Hammer Dies · Rivet Busters · Sledges.

"COPPCO UNIVERSAL"

WATER HARDENING GRAY LABEL

Balanced hardness and toughness. Good cold cutting properties. *Used for:* Pneumatic Tools · Large Shear Blades · Punches · Mandrels · Blacksmith Tools · Arbors · Vise Jaws · Dies—*Cold Heading, Trimmer, Heavy Stamping, Drawing, Forming, etc.*

"COPPCO 1.10"

WATER HARDENING GRAY LABEL

Gives maximum hardness. Holds a keen cutting edge. Resists wear. *Used for:* Milling Cutters · Circular Cutters · Woodworking Tools · Fine Shear Blades · Knives · Drills · Arbors · Reamers · Dies —*Embossing, Jewelers, Cold Heading, Threading, etc.*

"COPPCO STANDARD"

OIL HARDENING BLACK LABEL

Non-deforming. Deep-hardening. Wear resistant. *Used for:* Broaches · Milling Cutters · Threading and Tapping Tools · Reamers · Precision Tools · Gauges · Dies —*Blanking, Forming, Extrusion, Stamping, Shearing, Trimming, etc.*

"COPPCO" TOOL STEELS ARE ONE OF THE FAMILY ARISTOLOY STEELS OF ARISTOLOY "SPECIAL QUALITY" STEELS

COPPERWELD STEEL COMPANY WARREN, OHIO

A NEW MOLY-COBALT STEEL

for Tough cutting jobs

Here's a high-speed steel designed to give increased service when the cutting edge of the tool is working at elevated temperature.

We call this new moly-cobalt steel Bethlehem Moco.

Moco contains, roughly, 5 per cent molybdenum, 2 per cent vanadium, 5.25 per cent tungsten, 4 per cent chromium . . . *plus approximately 5.25 per cent cobalt.* The cobalt makes the tool retain its great cutting power as the surface temperature creeps up.

Moco is not an untried steel. We've put it through its paces for months on the toughest jobs in our plants. It has given an excellent account of itself. In fact, Moco has done a consistently better job than the steel it is replacing (an 18-4-1+ cobalt steel ruled out by the tungsten shortage).

We offer this new steel to you with the belief that after you've used it, learned how to handle it, you'll make it a stand-by in your shop.

Use Moco for the following jobs: axle-turning tools, tool bits, boring tools, tools for cutting hard iron, corrugating tools, cutting-off tools, shaper tools, tire-turning and wheel-turning tools and other comparable operations. Moco is especially well adapted for deep heavy cuts.

Write to Bethlehem Steel Company, Bethlehem, Pa., for further information about Moco, its properties and treatment.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

HOW WIDE AND THICK SHOULD A SHELL BAND BE?

Sufficiently thick to fill the groove, to take the rifling, and to withstand the stresses at the moment of greatest angular acceleration.

The width depends upon the velocity, and is usually 1/3 caliber in high-velocity guns. Narrow bands give less dispersion, but a minimum width is necessary to impart required rotational velocity and prevent undue erosion by escaping hot gases.

LEWIN-MATHES ROTATING SHELL BANDS

of pure copper or gilding metal have all the qualities you can expect for this important task. They are made true to your specifications. Our electrolytic copper refinery and our own fabricating mill are located within the same plant.

LEWIN LM MATHES

LEWIN-MATHES COMPANY • • EAST ST. LOUIS, ILLINOIS

PRODUCTION STRATEGY PREVENTS A TRAGEDY

Tragic indeed would be our tungsten shortage were it not for the strategic importance of Molybdenum as used to make metal-cutting tools of

MO-MAX

Molybdenum-Tungsten High Speed Steel

Long before the present crisis, thousands of tons of MO-MAX were purchased for quantity and quality production because tools made of MO-MAX, with less than two percent of tungsten and *no increase in vanadium*, proved 20 percent more efficient, on the average, than tools made of 18 percent tungsten steels. Now, with that distinguished service record in widely varying applications, with a reduced supply of tungsten and vanadium, with the need for production greater than ever, the use of MO-MAX is strategic, scientific, economic and patriotic.

For complete technical data write for booklet to any of the mills listed below or to The Cleveland Twist Drill Co., Cleveland, Ohio.

Milling keyways in stern diving-plane shaft—a typical job for MO-MAX steel.

These leading independent steel companies can supply you with standardized MO-MAX under their own trade names:

"LMW"	Allegheny Ludlum Steel Co.	"Molite 8"	Columbia Tool Steel Company	"Tatmo"	Latrobe Electric Steel Co.
"Mohican"	Atlas Steels, Ltd.	"Rex-T-Mo"	Crucible Steel Co. of America	"S.T.M."	Simonds Saw and Steel Co.
"Bethlehem HM"	Bethlehem Steel Company	"Di-Mol"	Henry Disston & Sons, Inc.	"Mo-Tung"	Universal-Cyclops Steel Corp.
"Mo-Cut"	Braeburn Alloy Steel Corp.	"Rex-T-Mo"	Halcomb Steel Co.	"Vul-Mo"	Vulcan Crucible Steel Co.
"Star Max"	Carpenter Steel Co.	"Mogul"	Jessop Steel Company		

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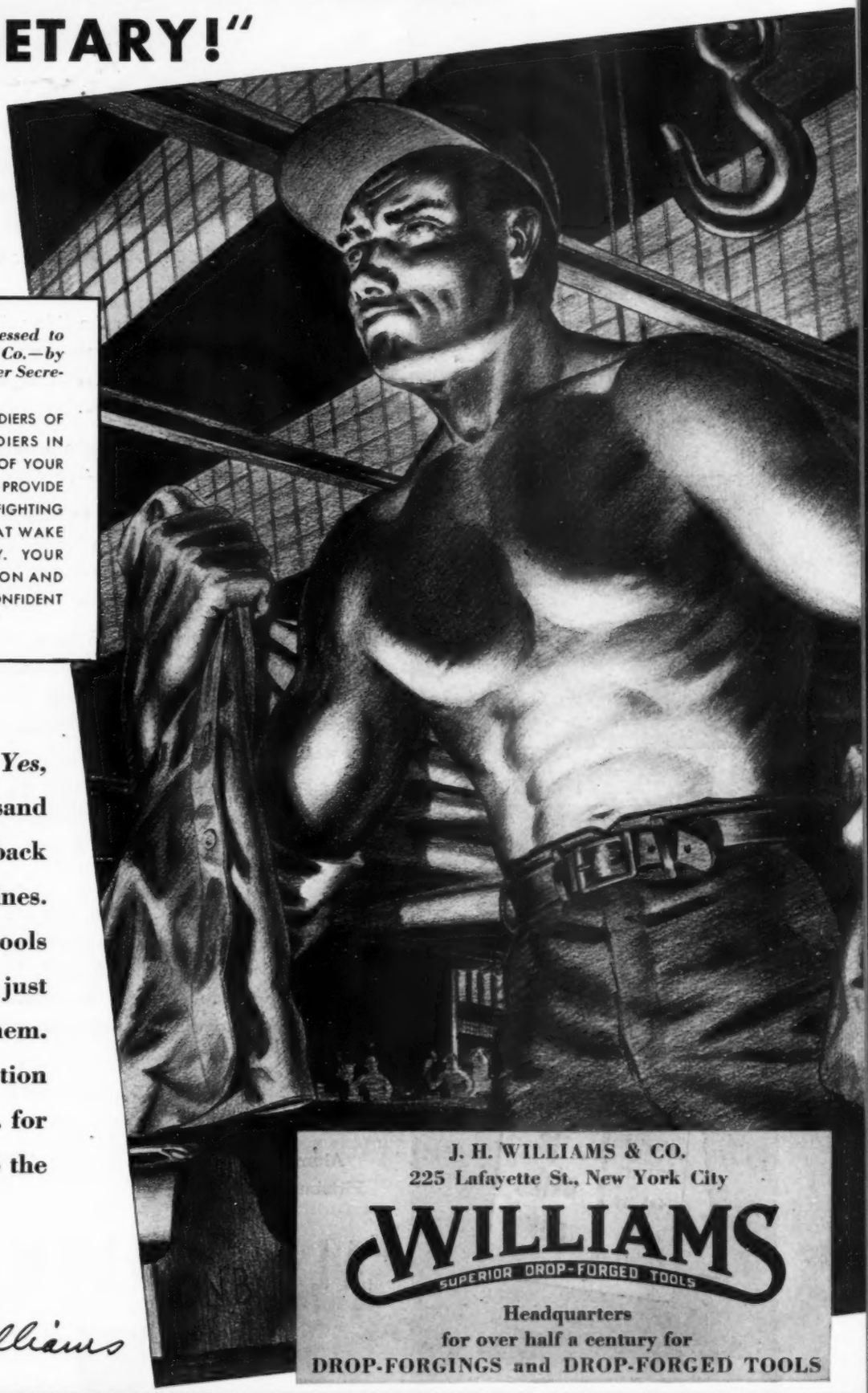
"YOU CAN COUNT ON US, MR. SECRETARY!"



The following message was addressed to the Employees of J. H. Williams & Co.—by the Hon. Robert P. Patterson, Under Secretary of War:—

"THE ARMY IS CALLING ON YOU SOLDIERS OF PRODUCTION TO BACK UP OUR SOLDIERS IN THE FRONT LINES WITH EVERY OUNCE OF YOUR ENERGY. THE ARMY LOOKS TO YOU TO PROVIDE THE WEAPONS OF VICTORY. THE FIGHTING WEAPONS WE LACKED YESTERDAY AT WAKE AND MANILA WE MUST HAVE TODAY. YOUR CONTRIBUTION MUST BE PRODUCTION AND MORE PRODUCTION. AMERICA IS CONFIDENT OF YOUR ANSWER."

OUR answer is "*Yes*, Mr. Secretary. All two thousand of us here at Williams will back up our boys in the front lines. We'll give them the best tools and forgings we can make, just as fast as we can make them. Count on us for 'production and more production'... for the 'weapons of victory' to the limit of our capacity."

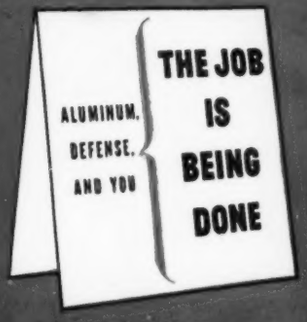
The men who work at Williams

J. H. WILLIAMS & CO.
225 Lafayette St., New York City

WILLIAMS
SUPERIOR DROP-FORGED TOOLS

Headquarters
for over half a century for
DROP-FORGINGS and DROP-FORGED TOOLS

WHAT 5¢ CAN MEAN TO YOUR FUTURE



★

HOW MUCH ALUMINUM we are making now is a censored secret. We are determined it shall be sufficient to the need.

HOW MUCH WILL BE AVAILABLE, after the war, is idle talk now.

THE PRICE OF ALUMINUM is the thing that's important. It is important to the war, because our reduction of the price of ingot from 20c to 15c is saving the Government many millions of dollars a year.

THAT FIVE CENTS doesn't make aluminum one whit more useful for war purposes—only more patriotic.

BUT IT DOES MAKE aluminum terribly important to the peace. Real peace means jobs for all. Jobs-for-all come into being only when people *want to* buy and *can* buy: Which means new things, better things, at a price.

IMAGINEERING is the word we have coined to describe the thinking which is used to get those new things ready. Imagineering is letting your imagination soar and then engineering it down to earth. Imagineering needs tools as well as brains.

THAT FIVE CENTS we've lopped off the price of aluminum, so far, has more potentialities of creating new things and better things, at a price, than any single thing we know of.

THAT'S WHERE YOU COME IN. You are the man *who*. You are the man America is counting on to make the jobs Americans are going to need. You are the man who is going to do the *Imagineering*, in your specialty, that is going to win the place for yourself, your employees, your associates.

YOU ARE GOING TO DO IT, and we hope you are going to let Alcoa help. We can, and we want to.

Aluminum Company of America, 2107 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

Welding Stainless?

★ Yes, far into the night—night after night—until the dawn of victory . . . they depend on **PAGE-ALLEGHENY STAINLESS STEEL ELECTRODES**—produced in close cooperation with the world's largest producer of Stainless Steel. That is possibly one of the reasons you can be certain that from **PAGE-ALLEGHENY** you can select the electrode that will give you deposit in the weld that equals the Stainless you are welding.

PAGE-ALLEGHENY STAINLESS STEEL ELECTRODES are shield-arc type; equally usable in horizontal and vertical positions; providing the exceptionally smooth beads that feature top quality welds.

Ask your local **PAGE** Distributor for a copy of this instructive and informative booklet on Stainless Steel welding. It will simplify the selection of your electrodes.

PAGE WELDING ELECTRODES

PAGE STEEL AND WIRE DIVISION • MONESSEN • PENNSYLVANIA

AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

BRONZE BEARINGS
STOCK SIZES FOR DEFENSE APPLICATIONS

BUNTING is aiding our government by producing large quantities of cast bronze bearings, both for the equipment used by our armed forces and the machine tools and other machinery employed in the manufacture of defense products. We are supplying bearings for aircraft, tanks, guns, ships and also insuring steady operation of America's vital production machinery by providing instant availability of the following essential items constantly carried in stock:

★ BUNTING Bronze Bearings, completely machined and finished, for equipment and maintenance of machine tools and industrial machinery.

★ BUNTING Bronze Bearings for electric motors, made and finished in every detail for immediate installation.

★ BUNTING Precision Bearing Bronze Bars for machinery maintenance, completely machined I.D., O.D. and ends.

Ask your wholesaler. Write for catalog.

THE BUNTING BRASS & BRONZE COMPANY, TOLEDO, OHIO

WAREHOUSES IN ALL PRINCIPAL CITIES

WE PRINTED THIS ADVERTISEMENT IN APRIL, 1940— AND THOUGHT IT WAS OUTSTANDING THEN.

5,000,000 pieces

from this Blanking Die the first year in service, and still

going strong, thanks to

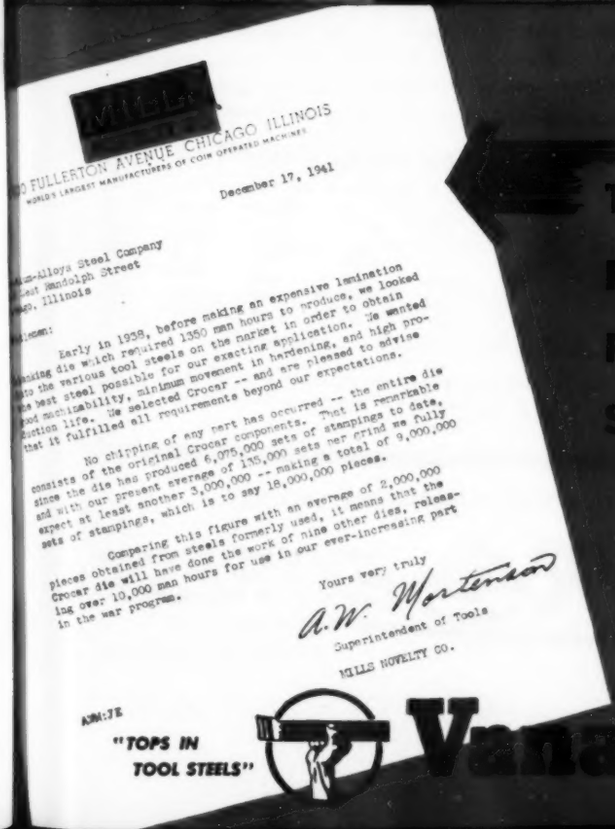
Mills Novelty Company went all the way with CROCAR in this high-production blanking die. Punch assembly included. They needed rotor and stator laminations in real quantity, with *dependability* that could be taken for granted.

So here's CROCAR's first-year record: 5,000,000 piece parts—127,000 blanks per grind on all sections, with only .004" to .006" stock removed per grind—running rate 120 strokes per minute. Stock blanked is armature grade silicon steel, .01875" thick.

Are Mills Novelty pleased? Here's the evidence—a second all-CROCAR die is now under way to join the first in maintaining stepped-up production for 1940.

Do you have a die that should be CROCAR? Let your VASCO Representative cooperate with you!

Vanadium-Alloys STEEL CO.



Mills

...0 FULLERTON AVENUE CHICAGO ILLINOIS
...WORLD'S LARGEST MANUFACTURERS OF COIN OPERATED MACHINES

December 17, 1941

...dium-Alloys Steel Company
...est Randolph Street
...go, Illinois

...lemen:

Early in 1938, before making an expensive lamination ...ching die which required 1360 man hours to produce, we looked ...into the various tool steels on the market in order to obtain ...the best steel possible for our exacting application. We wanted ...good machinability, minimum movement in hardening, and high pro... ...duction life. We selected Crocar -- and are pleased to advise ...that it fulfilled all requirements beyond our expectations.

No chipping of any sort has occurred -- the entire die consists of the original Crocar components. That is remarkable since the die has produced 6,075,000 sets of stampings to date, and with our present average of 135,000 sets per grind we fully expect at least another 3,000,000 -- making a total of 9,000,000 sets of stampings, which is to say 18,000,000 pieces.

Comparing this figure with an average of 2,000,000 pieces obtained from steels formerly used, it means that the Crocar die will have done the work of nine other dies, releasing over 10,000 man hours for use in our ever-increasing part in the war program.

Yours very truly

A.W. Mortenson

Superintendent of Tools

MILLS NOVELTY CO.

AM:JE

BUT TODAY—

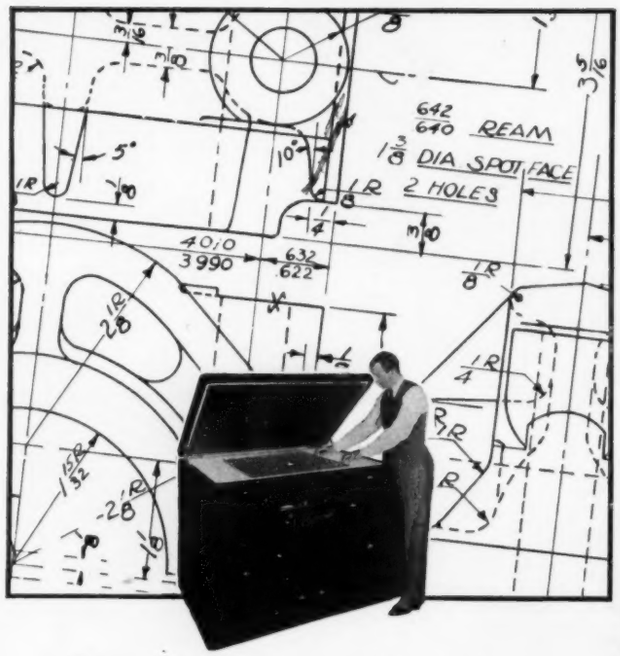
THIS SAME **CROCAR** DIE HAS PRODUCED MORE THAN **12,000,000** PIECES . . . LOOKS GOOD FOR AT LEAST SIX MILLION MORE . . .

AND HAS RELEASED OVER TEN THOUSAND MAN HOURS OF SKILLED LABOR FOR THE EXTENSIVE DEFENSE WORK OF THE CUSTOMER!

"TOPS IN TOOL STEELS"

Vanadium-Alloys STEEL CO.

LATROBE, PA.



The Draftsman that does 24-Hours' Work in 15-Minutes

● EVER NEEDED additional blueprints when the original tracing was not available? PORTAGRAPH—a modern photo-copy unit—will reproduce on tracing cloth, tracing paper, or standard photographic paper *any type of* blueprint, drawing or tracing! Think of it! No retracing. No drawing. No checking. No errors. PORTAGRAPH is simple, costs little to operate and requires no darkroom.

Portagraph Has Many Uses

For example, the expensive, time devouring retyping of specifications is accomplished by PORTAGRAPH in minutes with absolute accuracy! Vendor's information, sub-contracting data, priority papers, production records, important letters and a host of other material can be copied swiftly and economically.

Send the coupon, today, for free facts on curing complex drafting, engineering and copying problems in your plant.

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Please rush, without obligation, your booklet telling how PORTAGRAPH will slash drafting and copying time and costs.

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"TELL 'EM TO SEND IT BY AIR EXPRESS!"

Speed is essential these days—and efficient shipping service can help industry and business save invaluable time in doing their tremendous job. 'Fastest way' to get or send anything—whether a light assembly part, electrical equipment or a heavy replacement—is AIR EXPRESS.

This 3-mile-a-minute sky-service is amazingly economical, too. And there is no extra charge for *special* pick-up and *special* delivery within regular Railway Express vehicle limits in all cities and principal towns. International AIR EXPRESS to and from principal cities of Canada, Alaska, Bermuda, West Indies, Mexico, Central and South America. For service, just phone Railway Express and ask for AIR EXPRESS DIVISION.

EXAMPLES OF AIR EXPRESS ECONOMY

(Minimum Charge $1.00. Rates by Air Miles)

Air Miles	1 lb.	3 lbs.	5 lbs.	10 lbs.	25 lbs.
200	$1.00	$1.04	$1.12	$1.32	$2.00
500	1.00	1.28	1.60	2.40	5.00
1000	1.00	1.68	2.40	4.20	10.00
2000	1.00	2.48	4.00	8.00	20.00
3000	1.00	2.88	4.80	9.60	24.00

Proportionately low rates on heavier shipments

Direct 3-mile-a-minute service between over 370 key cities. Coordinated air-rail connections to 23,000 off-airline points.

'FASTEST WAY' MEANS AIR EXPRESS

AIR EXPRESS

Division of **RAILWAY EXPRESS**

"THIS EFFORT REFLECTS PRECISELY WHAT WE WOULD HAVE EVERY INDUSTRIAL PLANT IN THE COUNTRY UNDERTAKE"

Geo. T. Weymouth

George T. Weymouth, Chief
Industrial Salvage Section
Bureau of Industrial Conservation

The Bureau of Industrial Conservation has approved the Disston Conservation Control Plan for the practical aid it brings industry in speeding war time production, in saving working time and in conserving vital tools and materials.

Disston will provide individual instruction cards for each of your employees who work with files, hack saw blades, tool bits, metal cutting and wood cutting circular saws, planer knives, veneer knives, paper knives and other tools. The cards contain concise, expert instruction on the proper use and the best care of the tool, as well as the correction of faults in operation. Their practical purpose is to conserve essential materials, reduce unproductive delays, and lengthen tool life—and by so doing, to accelerate and increase production, improve workmanship and better your products.

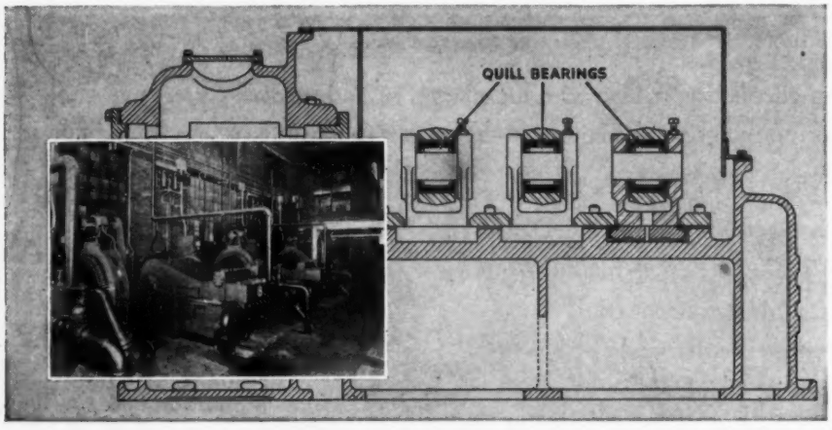
In addition Disston will send you, also without charge, Bulletin Board Posters and other promotion material for plant use—to encourage employee interest and participation.

Furthermore, you have at your command Disston Engineering Service. Wide experience qualifies Disston engineers to fit the most efficient tool to the job . . . help you meet the demands of emergency production . . . and aid you in your cooperation with the government.

Now is the time to enlist *your* plant in the national war on waste! Complete information will come to you at once following your inquiry. Write *today!* Henry Disston & Sons, Inc., 320 Tacony, Philadelphia, Pa., U. S. A.

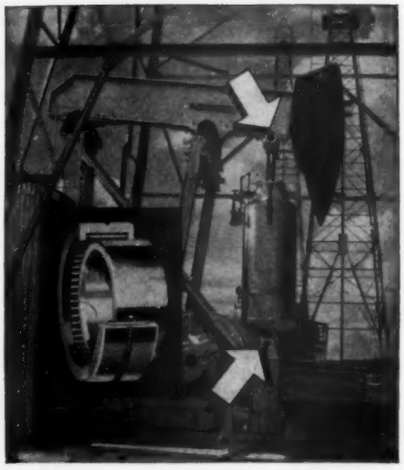
IN THE NEWS
WITH BANTAM BEARINGS

3-INCH ANTI-AIRCRAFT GUNS are true precision machines that must operate with extreme accuracy and complete dependability. In the design and construction of many of America's new weapons, the skill and experience of Bantam engineers are playing an important part. Bantam's broad background in the design and application of every major type of anti-friction bearing aids in the solution of new and unusual bearing problems.

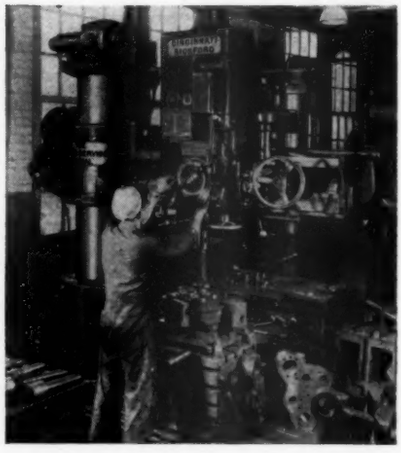


LONG, DEPENDABLE LIFE is essential in this application of Bantam Quill Bearings on the wrist pins of Baldwin Southwark Triplex Pumps. The pumps, shown in inset, are used to furnish high-pressure water for a large shell-forging plant, and deliver 450 gallons per minute at a working pressure of 1,500 pounds per square inch. Load application ranges from zero to maximum 95 times a minute. The Quill Bearings help keep maintenance costs down in this exacting service. For further information on this compact, high-capacity bearing, write for Bulletin D-104.

BANTAM'S ENGINEERING COOPERATION is especially valuable in meeting new and unusual requirements. Bantam makes every major type of anti-friction bearing—straight roller, tapered roller, needle, and ball. Bantam engineers aid in the selection of the type that best suits your application—or design special bearings in sizes and types that meet out-of-the-ordinary service requirements. If you have a difficult bearing problem, TURN TO BANTAM.



IN THE NATION'S OIL FIELDS, pumping units are working 'round the clock to meet wartime needs for this vital fluid. Leading manufacturers of pumpers have found that Bantam Quill Bearings contribute to efficient operation, reduce need for maintenance attention. Arrows on photograph show location of Quill Bearings on The Parkersburg Rig & Reel Company's 66-HK pumping unit—an application typical of the many oil field uses for the Quill Bearing.



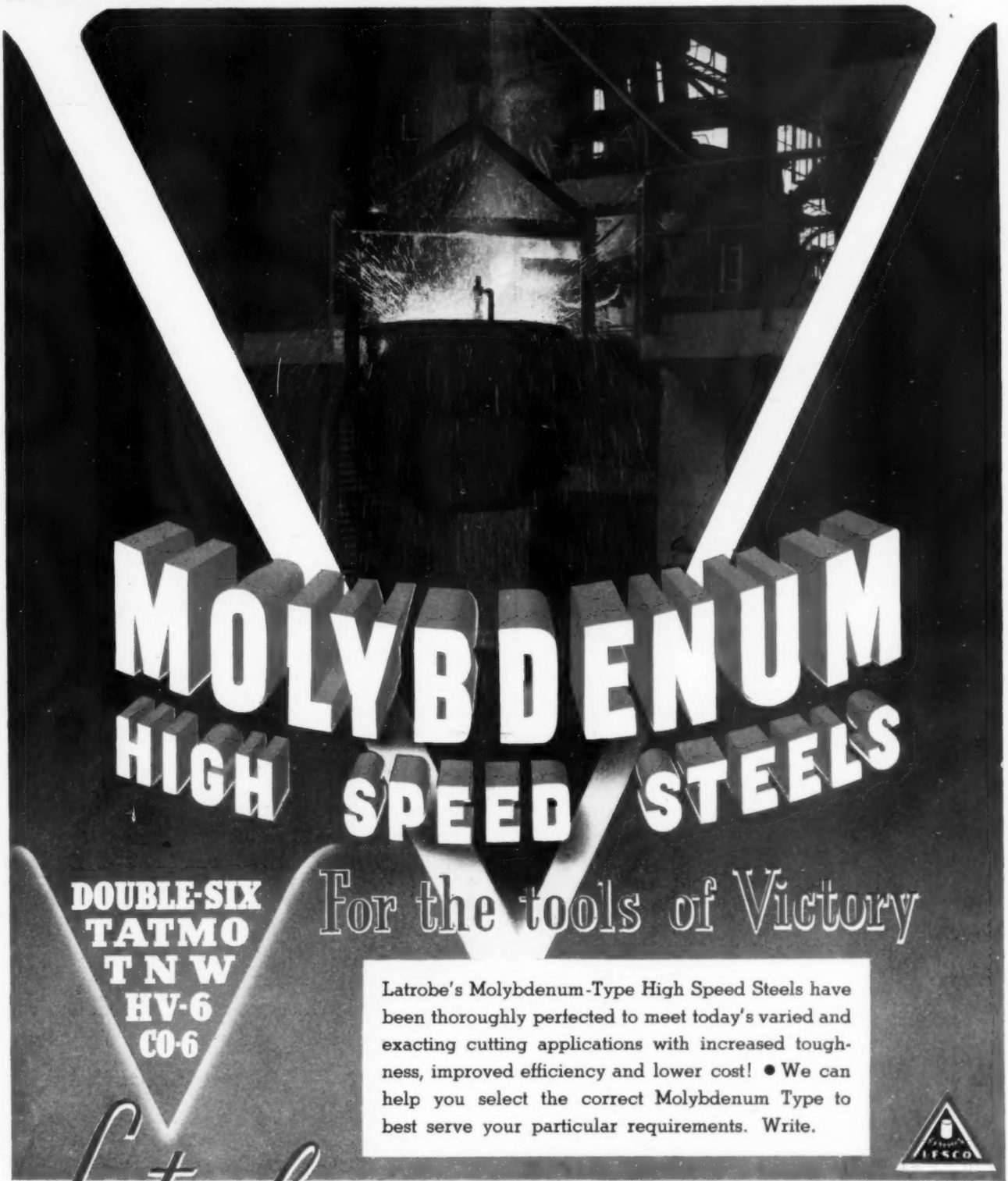
MACHINE TOOLS THAT MAKE MACHINE TOOLS take on new importance in speeding the nation's wartime production. These Super Service Radials built by The Cincinnati Bickford Tool Co. are working 24 hours a day, 7 days a week, helping to turn out turret lathes. Bantam Quill Bearings in these machines facilitate travel of the head along the arm—another instance of the adaptability of these compact bearings.

BANTAM BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

BANTAM BEARINGS CORPORATION • SOUTH BEND • INDIANA

LATROBE



MOLYBDENUM HIGH SPEED STEELS

DOUBLE-SIX
TATMO
T N W
HV-6
CO-6

For the tools of Victory

Latrobe's Molybdenum-Type High Speed Steels have been thoroughly perfected to meet today's varied and exacting cutting applications with increased toughness, improved efficiency and lower cost! • We can help you select the correct Molybdenum Type to best serve your particular requirements. Write.

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT ••• LATROBE • PENNSYLVANIA

CONSERVE CUTTING ★ OIL ★

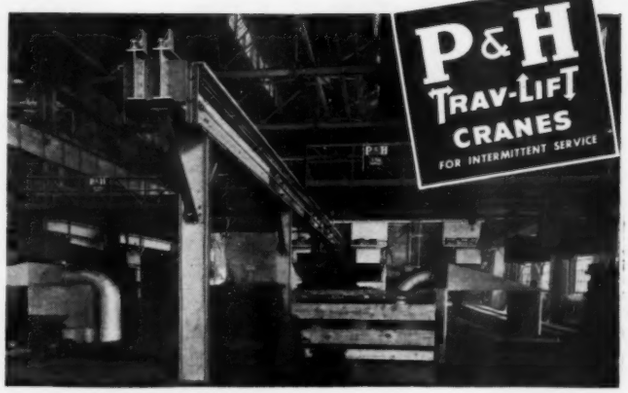
*RECLAIM UP TO 98.6% OF YOUR CUTTING OIL

Tolhurst Chip Wringers recover as much as 98.6% of oil from chips through the application of centrifugal force. No steam is used, thereby eliminating any loss of oil through emulsification. Unskilled help can operate Tolhurst Chip Wringers efficiently.

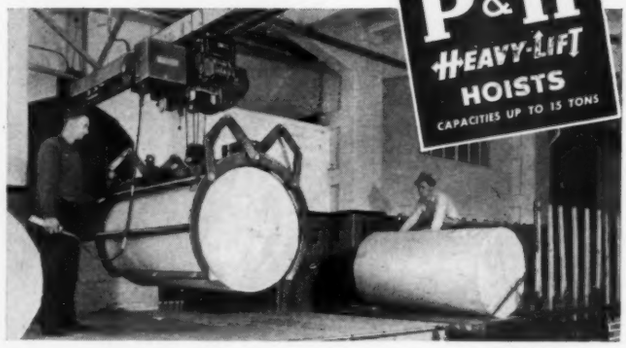
REDUCE TOOL WEAR — Tool room records show reductions in tool wear of as much as 50% after installing Tolhurst equipment. The plentiful supply of reclaimed oil results in a more generous and conscientious use of cutting oil. Tools require less attention. Production goes on uninterrupted. Accuracy is maintained. If your machine tools are used in vital war production, investigate Tolhurst Chip Wringers for conserving cutting oil — reducing tool wear. *Write or wire for FREE bulletin.*

TOLHURST
CHIP WRINGERS
Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

DELIVERIES ON TIME!



TO SPEED DEFENSE, P&H has cut delivery time on these three types of materials handling equipment from 38% to 46% in 7 months of intensive production effort. You now get faster delivery and you don't need "expediters" to get this vital equipment from P&H.



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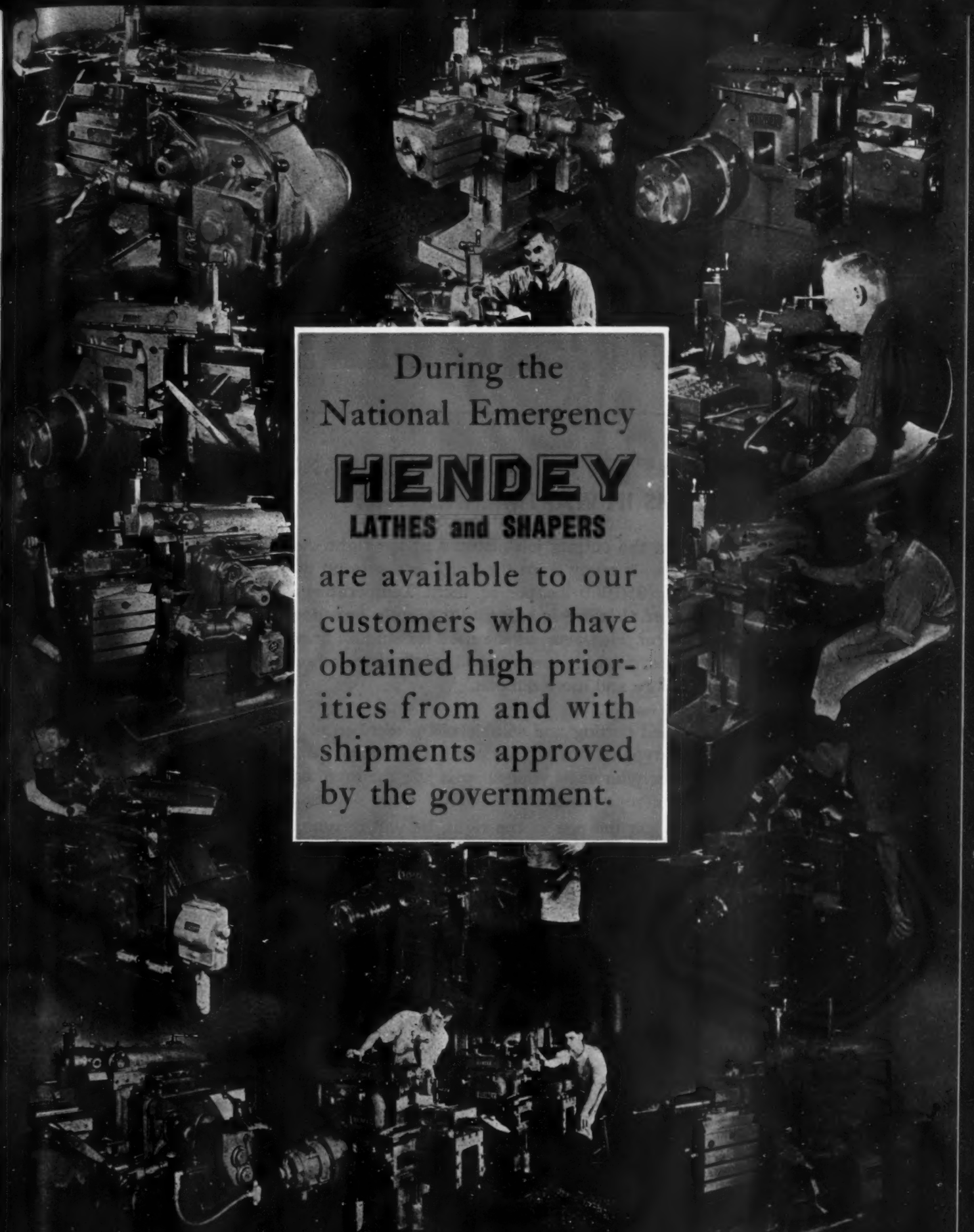

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Problem: Look at the cutting job pictured at the right. As that chip spirals away from the work, pressure on the tool may hit 350,000 lbs. per sq. inch! Temperatures may shoot past 1,000° F.! *Yet this job is relatively simple because it is a "roughing" operation.* However, as the need for smooth finish and close tolerances increases, choosing the *right* oil to lubricate and cool the cutting tool becomes more and more difficult.

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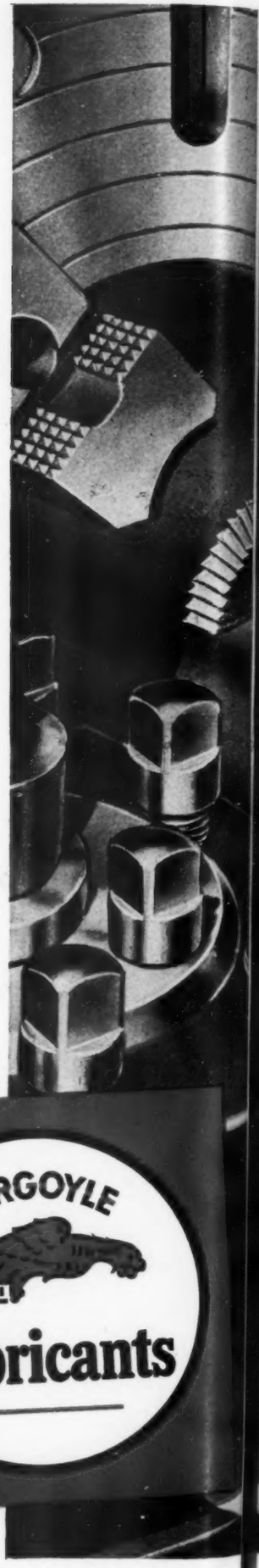

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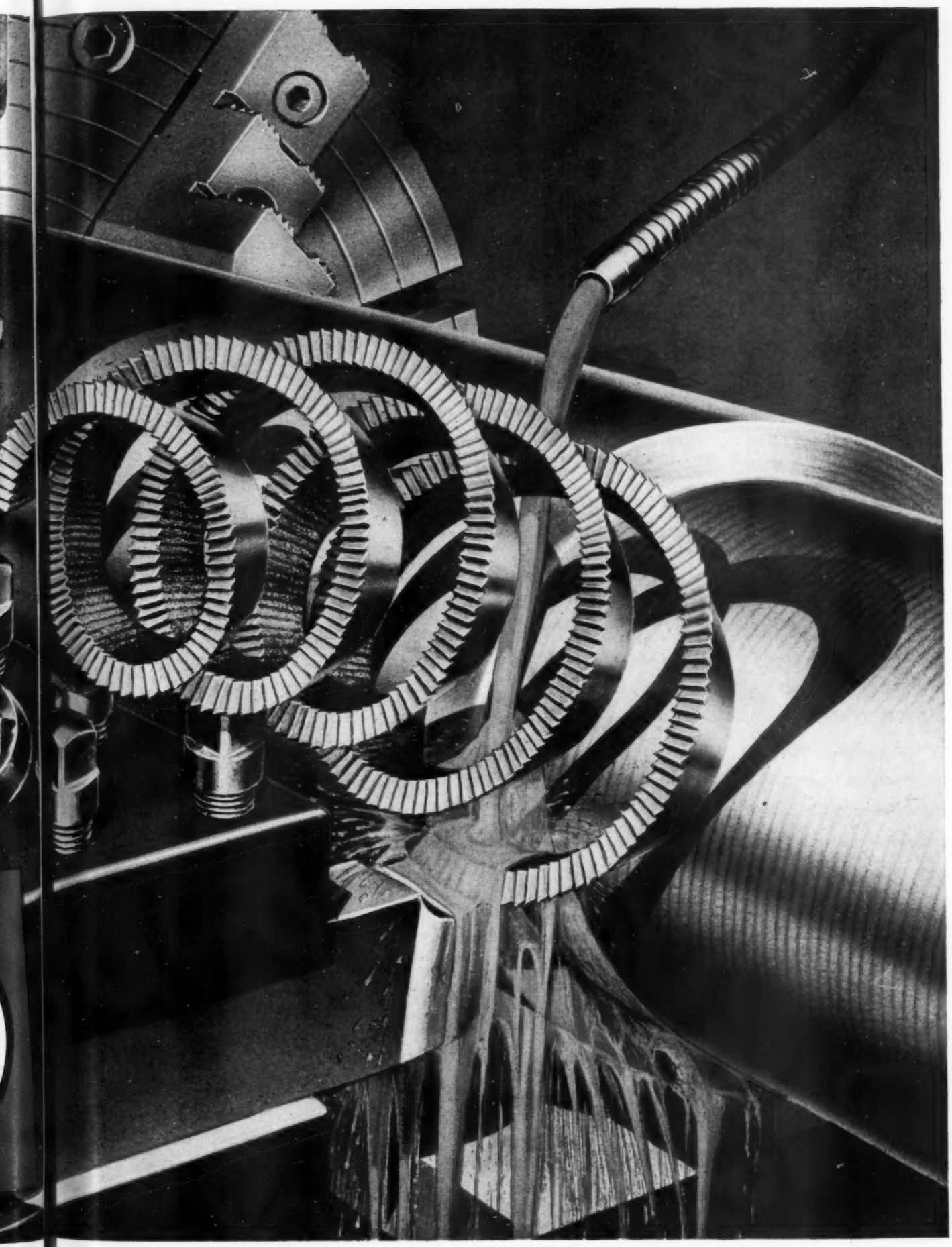
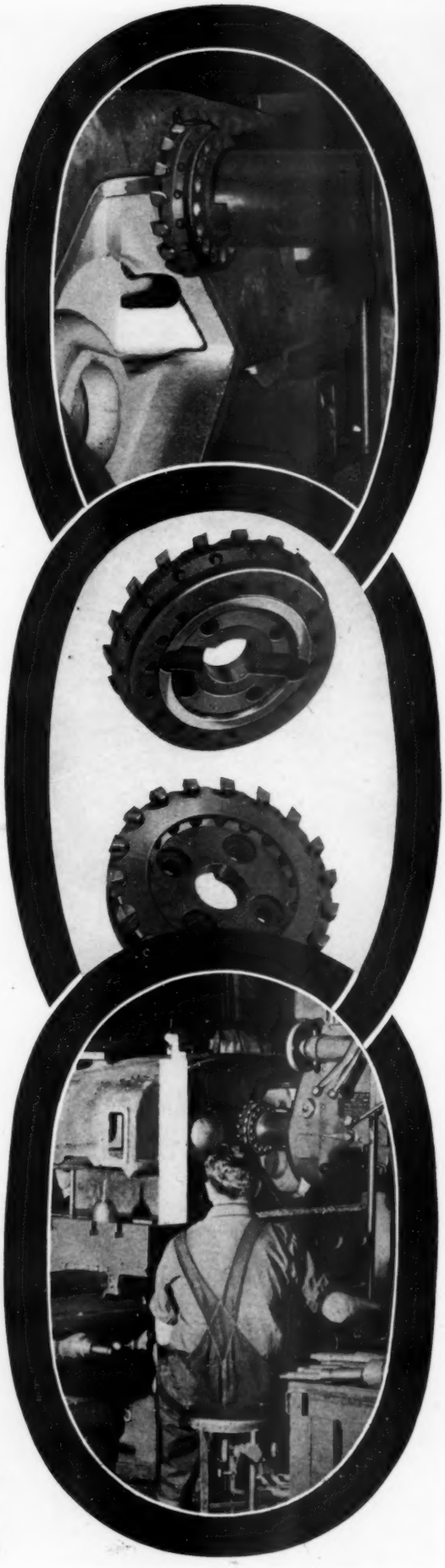


A "Vital" LINK in machine tool production —LOVEJOY MILLS



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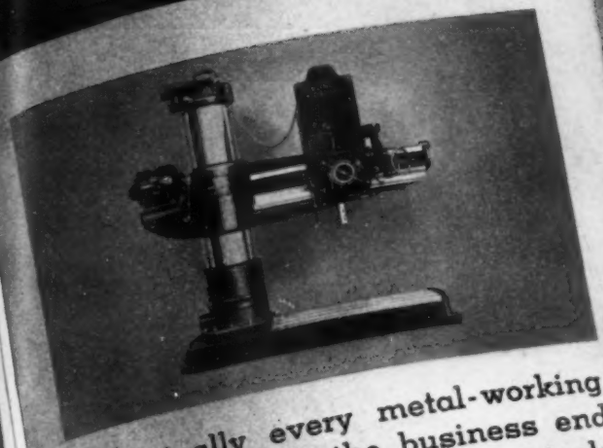

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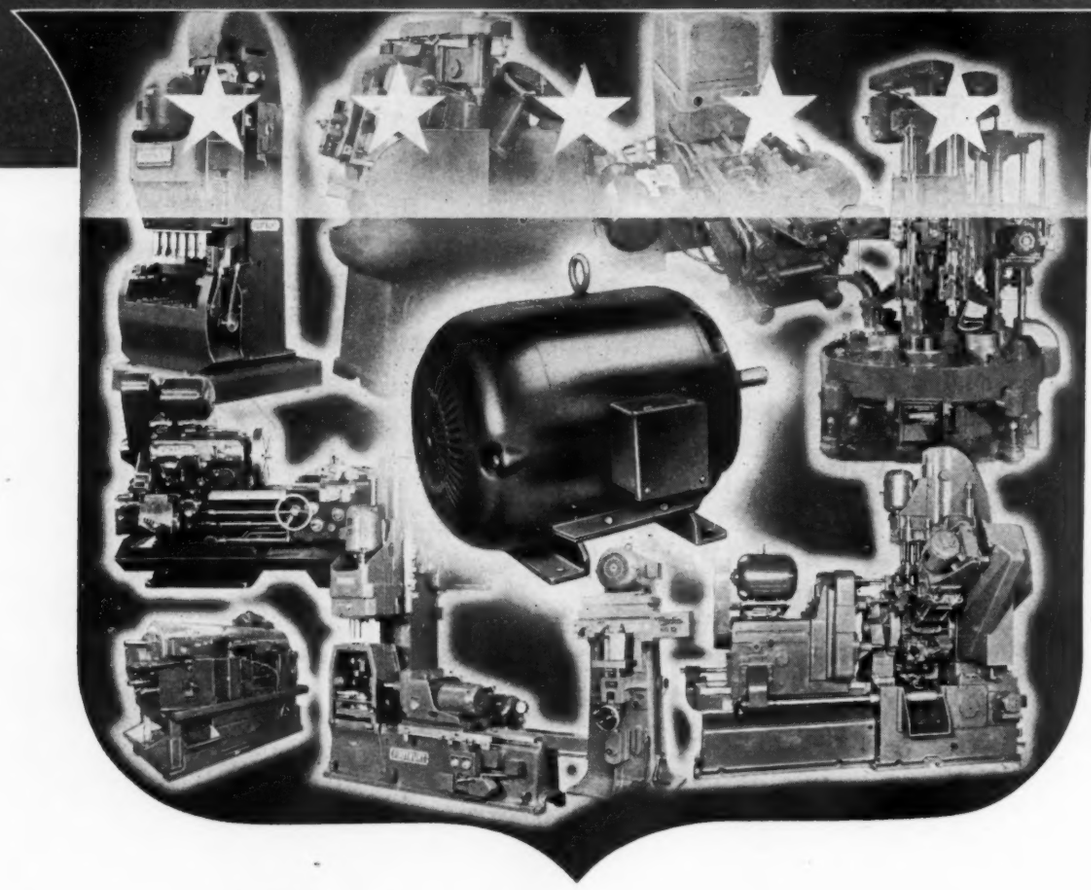

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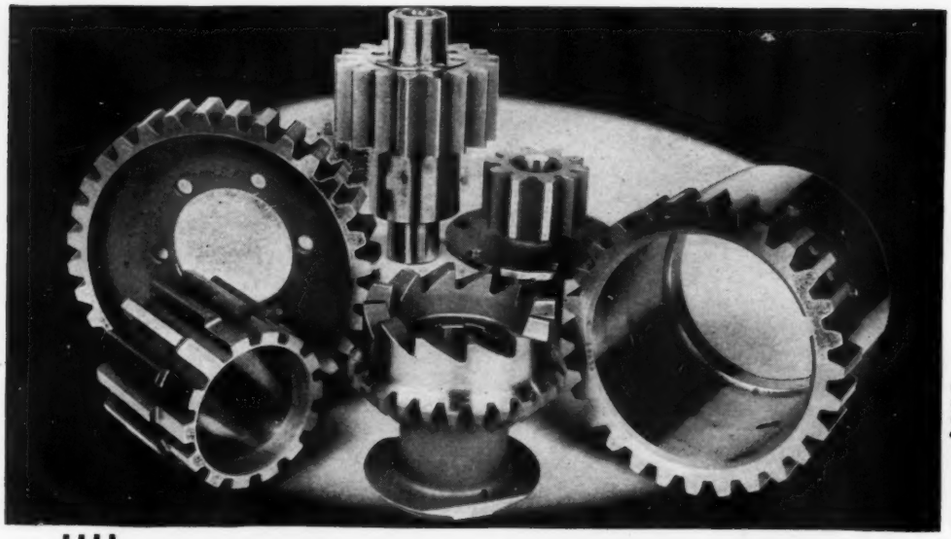

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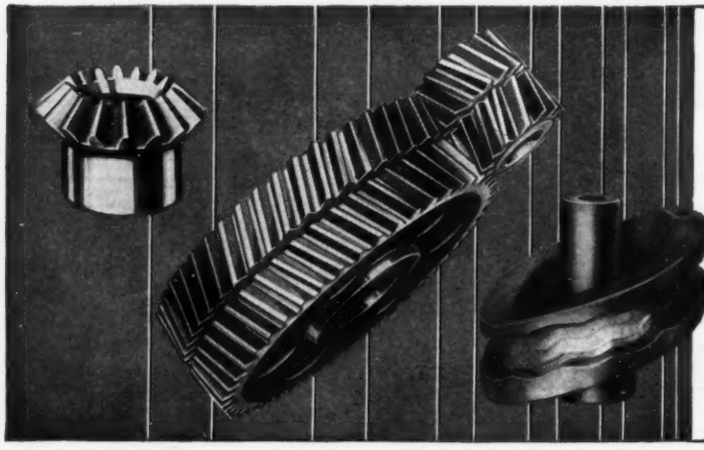

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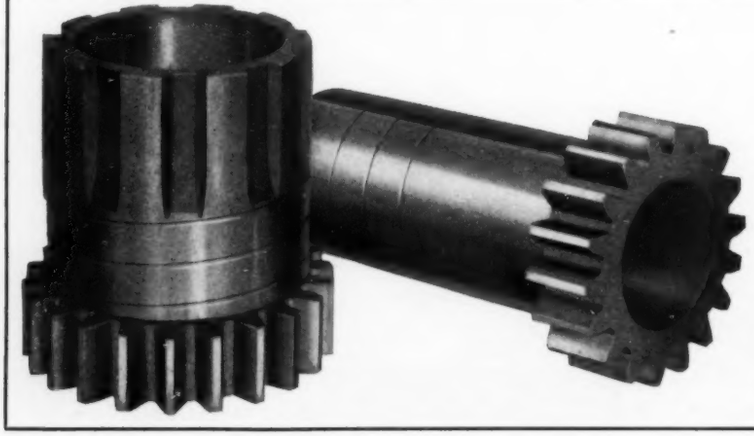

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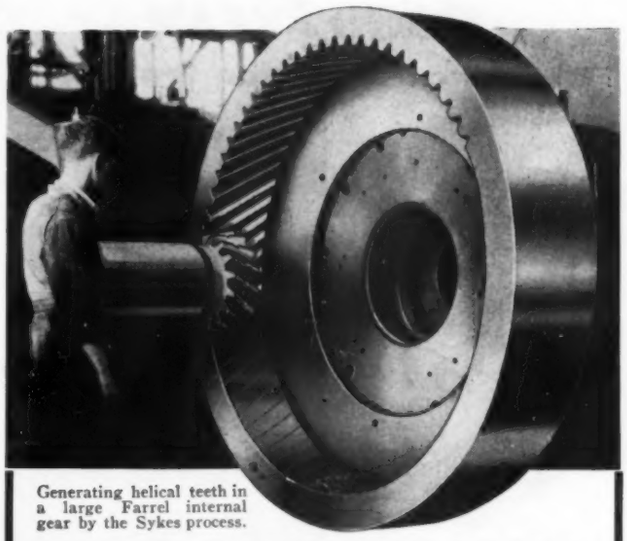

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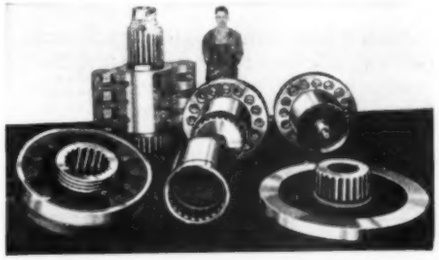

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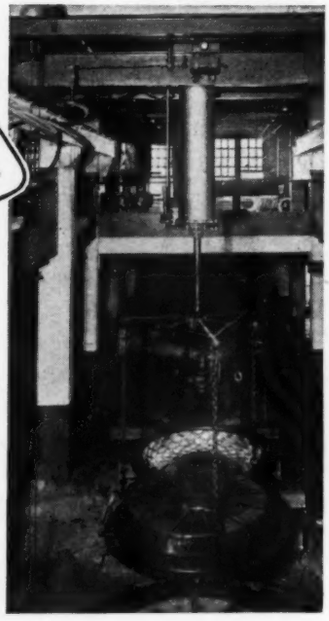

★ As illustrated above, the Goodyear Tire and Rubber Company last year solved the problem of handling the movement of heavy tire molds and heater lids with a Curtis Air Hoist. Loads average 30,000 pounds with a maximum of 40,000 pounds per operation. Since the installation of this Curtis Air Hoist in 1940, no maintenance whatever has been necessary.

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- One man operation—by ordinary labor

If production in your plant includes the hoisting of equipment or materials, it is more than likely that Curtis Air Hoists will speed up your work, release labor for other jobs, and lower production costs at the same time.

For complete information on Curtis Air Hoists and air powered equipment, send the coupon below for free booklet on "How Air Is Being Used in Your Industry."

CURTIS
ST. LOUIS • NEW YORK • CHICAGO • SAN FRANCISCO • PORTLAND

CURTIS PNEUMATIC MACHINERY DIVISION
OF CURTIS MANUFACTURING COMPANY
1924 Kienlen Avenue, St. Louis, Missouri

Please send me your free booklet "How Air Is Being Used in Your Industry" and further details concerning Curtis Air Hoists.

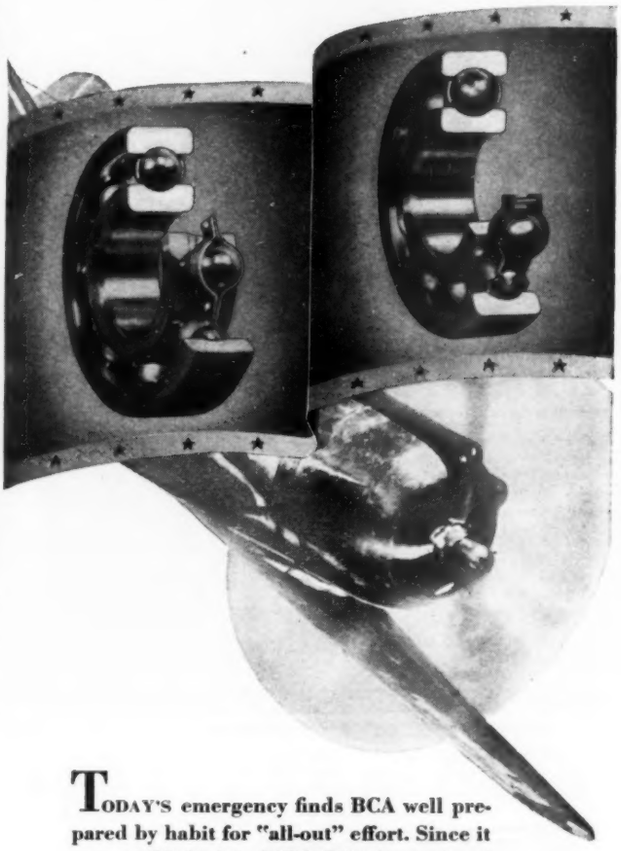
Name.....

Firm.....

Address.....

City.....State.....

"All-Out" Effort
TAKES ON NEW MEANING IN 1942



TODAY'S emergency finds BCA well prepared by habit for "all-out" effort. Since it was established in 1897, BCA has refused to let business drift along "as usual." By close application . . . by working hard and constantly in association with equipment manufacturers . . . BCA contributed materially to the development of ball bearings for many types of vehicles and machinery.

In the past, BCA's "all-out" effort produced such marked improvements as the Composition Seal Bearing . . . the Prelubricated Clutch Bearing and the "Burr Relief" Shaft Bearing. Today, this effort is devoted to the armed forces and the industries vital to victory. Tomorrow, it will provide America with still better radial . . . angular contact . . . and thrust ball bearings.

BEARINGS COMPANY OF AMERICA
LANCASTER, PENNSYLVANIA

BCA
RADIAL • ANGULAR CONTACT • THRUST
BALL BEARINGS

NOW MORE THAN EVER BEFORE

Versatility

IS AN IMPORTANT CHARACTERISTIC OF

VICKERS HYDROMOTIVE EQUIPMENT

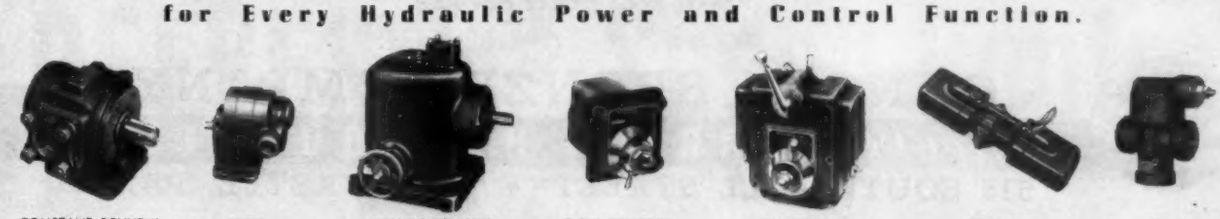
Growing material shortages and the restrictions imposed by defense priorities are forcing the use of many substitute materials that require changes in existing processing equipment and also the development of new machines. When the present abnormal defense needs have been satisfied, the capital equipment built for special defense projects must be converted to peace-time production.

The hydraulic method of control and power application is inherently the most flexible . . . as exemplified by Vickers Hydromotive Equipment. A machine that has been provided with Vickers pumps and controls is more versatile in operation and can be converted to an entirely different process in minimum time and at least cost. Ask for a Vickers Application Engineer to discuss your problems.

VICKERS *Incorporated*

1410 OAKMAN BLVD., DETROIT, MICHIGAN

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function.



CONSTANT DELIVERY PUMPS | FLUID MOTORS | VARIABLE DELIVERY PUMPS | FLOW CONTROL VALVES | TRAVERSE & FEED PANELS | SOLENOID OPERATED VALVES | PRESSURE CONTROLS

Standard Vickers Units can be re-arranged in different circuits to get different results.

JOHNSON BRONZE

SLEEVE TYPE BEARINGS

How to make Good Motors *BETTER*

NEW *Catalogue*

Lists and describes the most complete stock bearing service available. Write for your free copy.

Are your motors delivering the type of performance you have a right to expect? Before you blame the motor—check the bearings. Are they *assisting* in the operation or do they retard it? Are replacements too frequent . . . too costly?

It makes little difference whether you are buying, building or repairing motors, JOHNSON BRONZE can help you. In new equipment we can help you design the *type* of bearing that will guarantee the most efficient operation. For replacements, we offer you the largest range of sizes and types in bearings available. In order to get the most from your motors —consult with JOHNSON BRONZE. Let us help you make good motors *BETTER*.

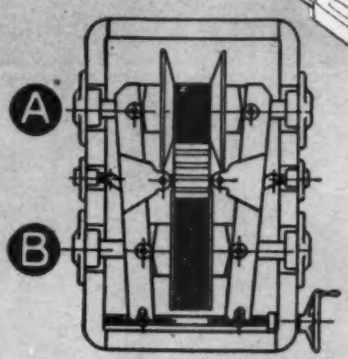
JOHNSON BRONZE COMPANY

Sleeve BEARING HEADQUARTERS

515 SOUTH MILL STREET • NEW CASTLE, PA.

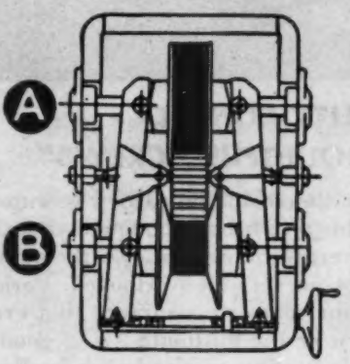
See HOW THE REEVES TRANSMISSION PROVIDES COMPLETE SPEED ADJUSTABILITY . . .

"X-ray" view of REEVES Enclosed Design Transmission.



AT MINIMUM SPEED POSITION

On constant speed shaft "A," cone-faced discs and speed-changing levers are *farthest apart* while the V-belt runs at *smallest* diameter between the discs. On variable speed shaft "B" reverse is true and shaft runs at *minimum* speeds.



AT MAXIMUM SPEED POSITION

On constant speed shaft "A," cone-faced discs and speed-changing levers are *closest together* while the V-belt runs at *largest* diameter of the discs. On variable speed shaft "B" conditions are reversed and this shaft runs at *maximum* speed.

The entire speed range is covered smoothly, without steps or jumps, from one speed to another and while the driven machine is in operation. No interrupting production.

"One of the best investments we ever made. Your drives have been in operation on our machines for years with negligible maintenance expense," says a Cleveland manufacturer.*

You can quickly see by these diagrams how the REEVES Variable Speed Transmission provides any driven machine with infinite speed adjustability.

Design is based on the proved and tested principle of a V-belt driving between two pairs of adjustable cone-faced discs mounted on parallel shafts. One shaft receives power at constant speed from motor, lineshaft, etc. The other, connected to the driven machine, transmits power at infinitely adjustable speeds above and below the speed of the constant speed shaft as the V-belt assumes different diameters of contacts against each set of discs.

Power is transmitted positively because of non-slipping, wedge-like action of the rugged REEVES endless cord V-belt. Equally important—any speed setting is maintained without fluctuation because *belt tension is automatically controlled at all driving diameters.* With REEVES speed adjustability, positive and accurate over full range, machines can be run at greatest efficiency under every changing condition.

Sizes from fractional to 87 h.p. Speed ratios from 2:1 through 16:1. Vertical and horizontal models. Manual, automatic or electric remote controls for speed changing. Write us.

REEVES PULLEY CO., *Dept. A*, COLUMBUS, IND.

* Name on request.

REEVES *Accurate Variable* Speed Control

A million times a week

EMERSON PROVES THE VALUE OF PARKER-KALON QUALITY-CONTROL

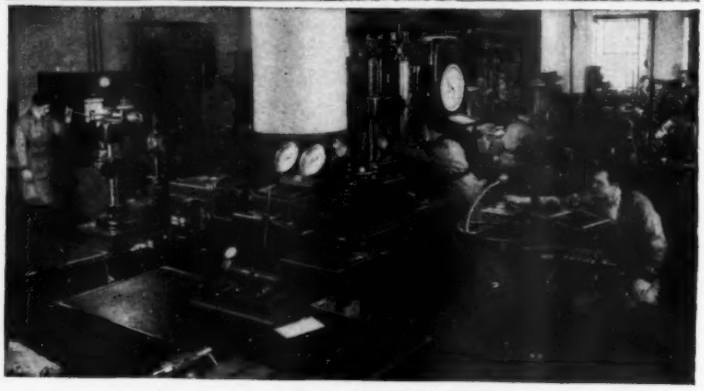
"DURING a busy week, we often use more than a million Parker-Kalon Self-tapping Screws", says Emerson's* engineer. "We've tried others, but always found good reason to prefer Parker-Kalon . . . they drive easier, with less torque and less wear on driver bits . . . and our punishing 'shake' tests show that *they stay in tight!*"

The sure, trouble-free performance of a hundred or a million Parker-Kalon Self-tapping Screws is the result of rigid laboratory control of quality. Every safeguard is taken to protect you against "doubtful screws" . . . screws that *look* all right but some of which fail to *work* right.

Parker-Kalon Quality-Controlled Self-tapping Screws put an end to "slow-ups" . . . you can start every P-K Screw quickly and easily, *and count on it to hold!* Trouble-free performance boosts the time-and-labor savings obtainable with Self-tapping Screws. "Doubtful Screws" rob you of part of the benefits you get by eliminating tapping . . . or fumbling with bolts and nuts . . . or riveting in hard-to-get-at places . . . or inserts in plastics.

No matter what material you're assembling – sheet metal, heavy steel, die cast metal or plastics – there's a type of Parker-Kalon Self-tapping Screw – thread-cutting and thread-forming – that will save time and money on the job. Parker-Kalon Corp., 194-196 Varick Street, New York.

* *Emerson Radio & Phonograph Corp.*



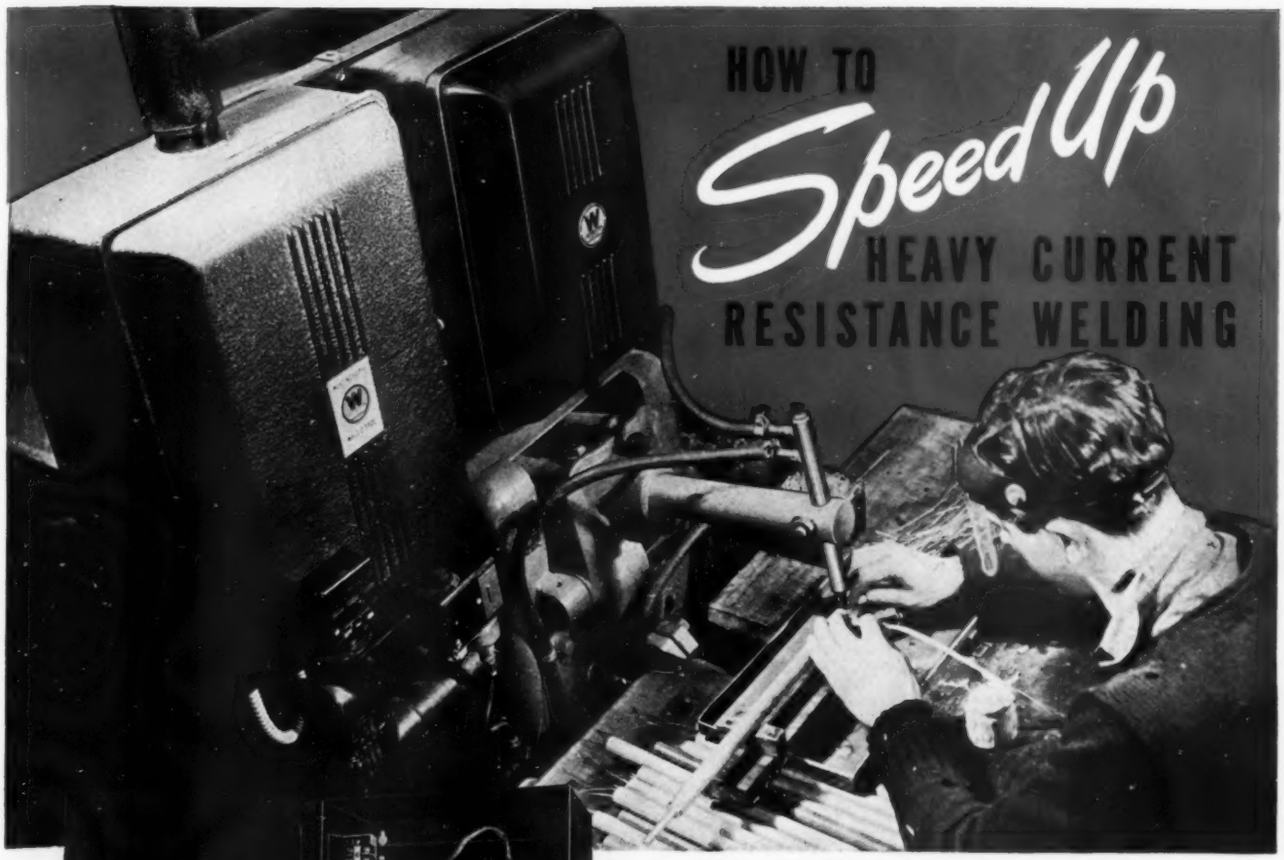
PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS
Give the Green Light • to Defense Assemblies

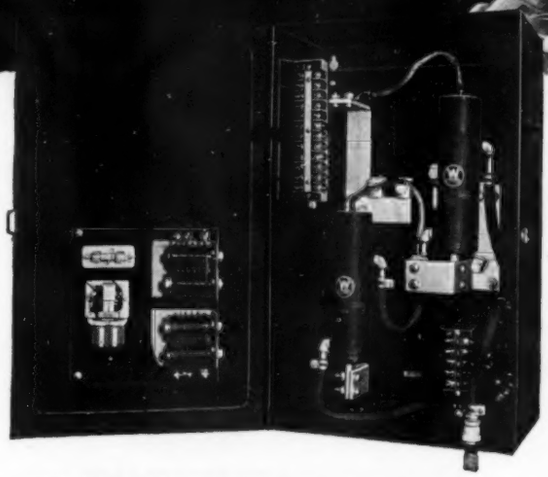
P-K QUALITY-CONTROL ELIMINATES "DOUBTFUL SCREWS"

This Parker-Kalon Quality-Control Laboratory is without counterpart in the screw industry. Through unequalled testing and analytical facilities it exerts rigid control over the quality of every screw produced. Not one detail is overlooked. Parker-Kalon Quality-Control is your complete assurance that every P-K Screw you use – *the first or the millionth* – is as good as modern science and manufacturing methods can make it.

SOLD ONLY THROUGH RECOGNIZED DISTRIBUTORS

SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY . . . AND OTHER FASTENING DEVICES





WELD-O-TROL PAYS DIVIDENDS

- **IN TIME:** saves man-hours required for maintenance.
- **IN PRODUCTION:** allows greater effective production time.
- **IN WELD QUALITY:** enables resistance welding of many nonferrous metals; produces more uniform, stronger welds.

. . . ADD WELD-O-TROL . . .

THE FAST, SILENT POWER SWITCH *WITH NO MOVING PARTS*

Weld-O-Trol, the power switch with *no moving parts,* eliminates the mechanical limitations on high speed, heavy current resistance welding.

Installed with existing welder-timer equipment, it steps up production because of fewer maintenance outages. It operates on the electronic valve principle, without mechanical contacts, and eliminates frequent maintenance delays and replacement costs.

Weld-O-Trol is a lightweight, compact unit, easily installed with your present equipment. Bulletin F-8451-A contains the complete Weld-O-Trol story. Send for your copy today. WESTINGHOUSE ELECTRIC & MANUFACTURING CO., EAST PITTSBURGH, PA., DEPT. 7-N.

J-21151

Westinghouse

WELD-O-TROL

The power's ON! YOUR DISTRIBUTOR makes the connection

MANUFACTURING SUPPLIER
-and keeps the current of mill supplies flowing steadily to our war industries
MANUFACTURING CONSUMER

Your Distributor connects you with *live* sources, large resources of supply. He knows manufacturers' stocks and specialties; he knows his customers' needs and shortages. He *acts* to bring the two together in a continuous flow of *PRODUCTION*-power.

He can close the circuit of non-stop production because his *own* connections are "solid." He serves his supplier as local warehouser. For years he has "gotten the business" for the manufacturer. Now he works that lever to *get the deliveries* for his customers!

The Allen Mfg. Company ★ ALLEN ★ Hartford, Conn., U.S.A.

WEBBER Gage Blocks

Provide accuracy necessary for interchangeable parts

Accuracy of Production

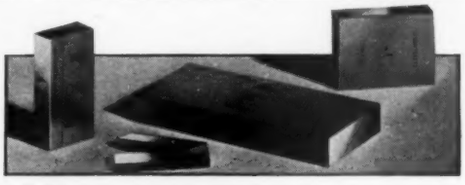
Webber Gage Blocks assure your production of precision tolerances that permit interchangeability.

Gage Blocks by Experts

More than ten years devoted to the exclusive development and manufacture of Gage Blocks gives Webber a background of experience reflected in the accuracy and dependability of their product. The Webber organization knows metals and all their physical characteristics during process of manufacture.

Ideal Manufacturing Facilities

Today Webber Gage Blocks are produced in a most modern—completely insulated—properly air conditioned plant thus guaranteeing a constant temperature and the ultimate in accuracy.



PROMPT DELIVERIES TO MANUFACTURERS FURNISHING REQUIRED PRIORITY CERTIFICATE.

Individual standard gage blocks as illustrated may be furnished to meet specific requirements.

Set 81-B Standard working set. 81 Blocks in sizes from .050" to 4.000". Range .100" to 12.000" in steps of .001", .200" to 12.000" in steps of 0001". Accuracy .000008". Price $250.00.

Standard Inspection Set 81-A consisting of 81 Blocks in sizes from .050" to 4.000". Range same as 81-B. Accuracy .000004". Price $350.00.

Set 40-B for Tool Room or Small Production Shop contains 40 Blocks in sizes from .100" to 4.000". Range .200" to 10.000" in steps of .001" and .300" to 10.000" in steps of .0001". Accuracy .000008". Price $150.00.

Webber Gage service is complete. Try it.

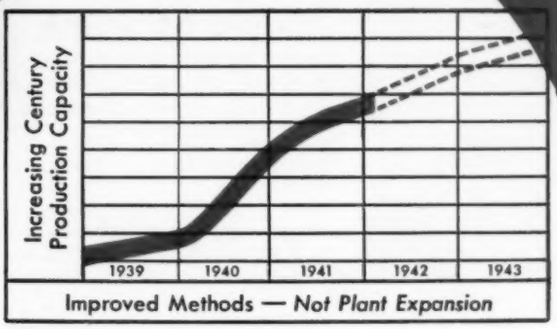
WEBBER GAGE CO.

12901 Triskett Road CLEVELAND, OHIO

WEBBER Gage Company

CLEVELAND...OHIO

War Industries *Look to* CENTURY MOTORS!



Thanks to more than two years of careful planning Century is meeting war production demands!

Since September of '39 Century has been planning its production facilities and methods to keep pace with the ever-increasing demand for the types and horsepower ratings of motors we knew would be needed for defense and war efforts — without plant expansion!

Wherever electric motor power is a factor in operating war machines — or in producing them — you'll find Century able to supply AC or DC Motors and Generators needed for the World War effort.

Call in your nearest Century Motor Specialist — you'll find him experienced and cooperative. He's working for Victory, too.

CENTURY ELECTRIC COMPANY

1806 Pine Street St. Louis, Missouri

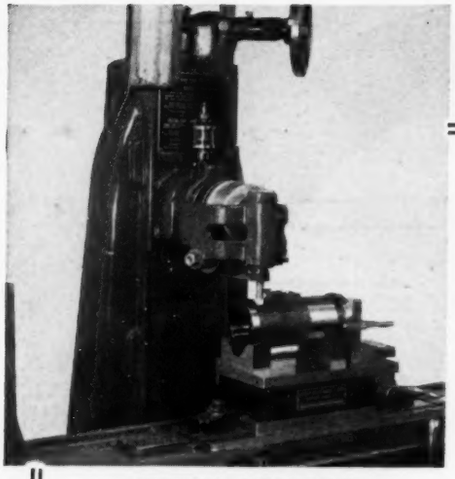
Offices and stock points in principal cities

Century MOTORS

One of the Largest Exclusive Motor and Generator Manufacturers in the World.

266

★ ★ ★ A few of the Century Plants ★ ★ ★



VERTICAL ATTACHMENT
Grinding Rectangular Opening in Trigger Casing

NEW! LIBERTY HI-SPEED GRINDING ATTACHMENTS

for quicker set-ups on a wide range of work

Accuracy and speed in grinding angles, slots, recesses and surfaces which are difficult to get at with large wheels or which mean slow set up with small wheels are assured with Liberty Attachments.

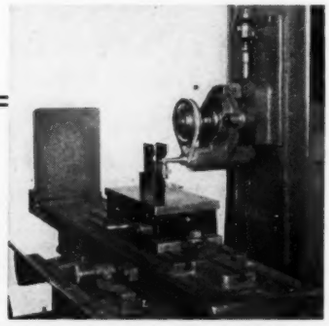
These highly accurate, completely assembled units, with precision bearings throughout, are designed for the most accurate grinding service on gages, tools, dies and other exacting work of this kind. They can be attached quickly and easily and eliminate time ordinarily wasted in set-up on surface grinders.

Made in Horizontal and Vertical types, with any size bores. Pulley belts and grinding wheels furnished at no extra cost. Either type can be shifted to a wide number of grinding positions. These Liberty units fit Brown & Sharpe, Reid and other makes of surface grinders.

INVESTIGATE TODAY

Write for complete information specifying diameter of spindle head, type and make of grinder.

HORIZONTAL ATTACHMENT
Grinding Gaging Seat on Special Gage



VERTICAL ATTACHMENT
Grinding Clearance of Broach Teeth

LIBERTY
TOOL & GAGE WORKS
PROVIDENCE, RHODE ISLAND

Get the INSIDE STORY on Mac-it Hollow Set Screws!

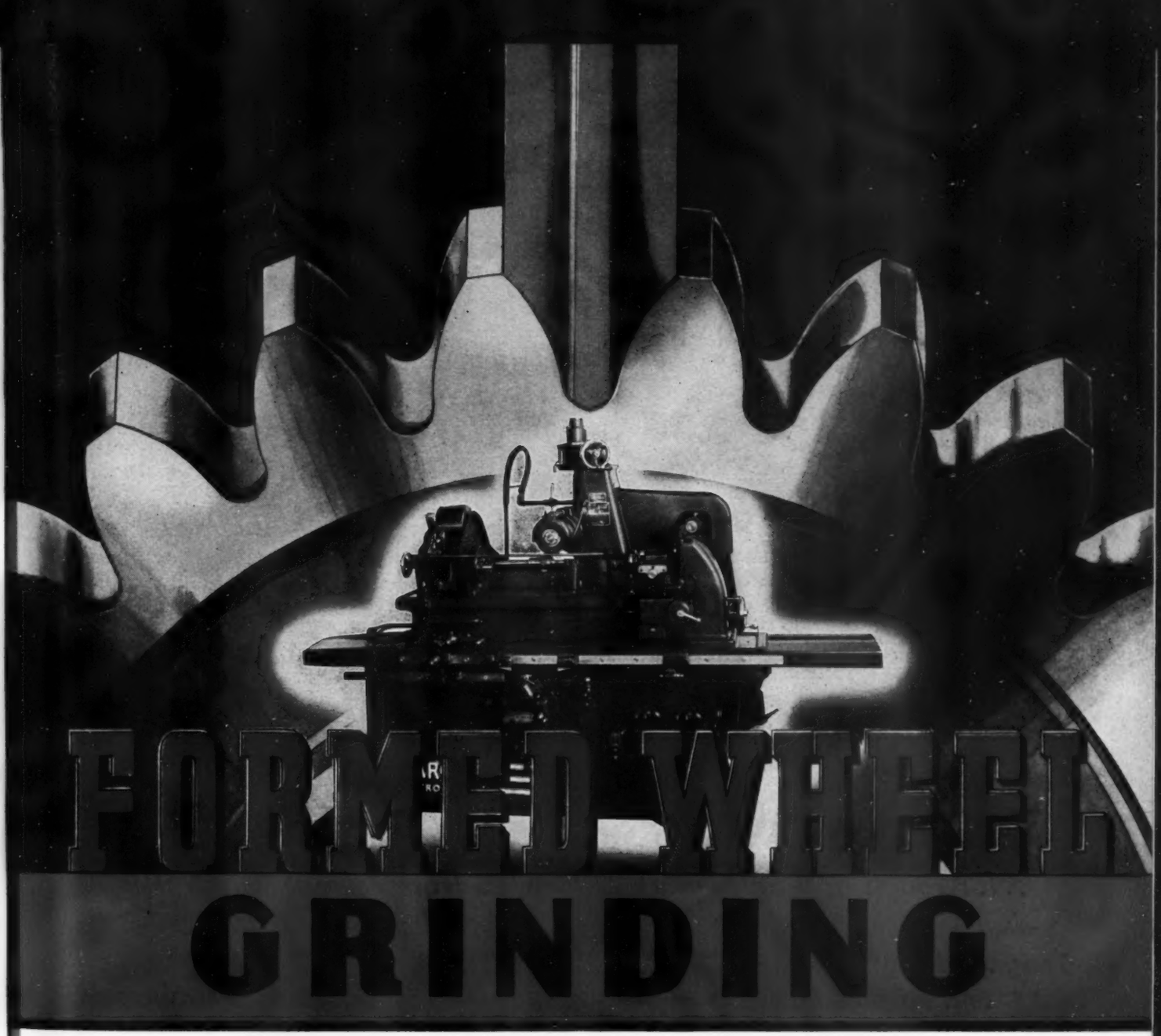
It's what you *don't see* in a hollow set screw that shows up in service. Here are a few of the "hidden qualities" packed into every Mac-it.

Produced from electric furnace steel, Mac-its are milled from solid bars to insure accuracy. Each angle of the sockets is accurately *cut* to insure positive key engagement.

Every Mac-it shown here is standard. For details call your Mac-it distributor or write us direct.

LOCK IT!
Hollow lock screws are available for use with hollow set screws. Positive action is insured.

THE STRONG CARLISLE & HAMMOND CO., Cleveland, Ohio



FORMED-WHEEL GRINDING

Adjacent tooth surfaces and any type of root ground at the same time . . . We manufacture machines for grinding—

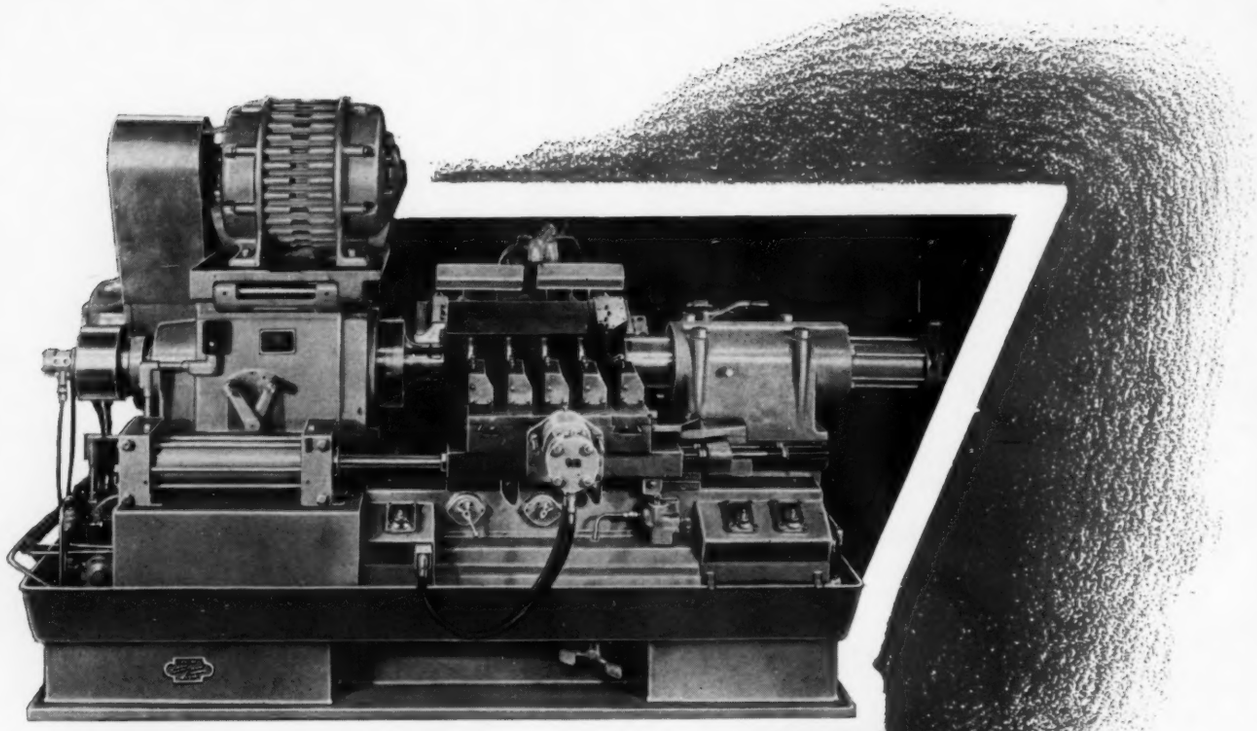
External Spur Gears
Internal Spur Gears
Internal Splines
Racks—Straight or Oblique
Worms—Right or left; helix up to 45°
Splines (keys and roots) . . . Spline Grinders are adaptable for straight and involute splines; for broach and serration grinding.

NO OTHER METHOD PRODUCES SO FINE A FINISH

We maintain a Service Division for Grinding—

External Spur Gears • Internal Spur Gears • Helical Gears
Racks • Splines

The GEAR GRINDING MACHINE COMPANY
DETROIT MICH. U.S.A.



SPARKS

Semi-Automatic HYDRA-FEED LATHE

. . . for rough and finish work on SHELLS *from 75 M/M to 155 M/M*

Designed for SPEED *and* ACCURACY

Shell bodies and work similar in shape can be rough and finish machined at high speed to close limits on this new SPARKS machine. It is sturdy in design and amply powered for long hard service and maintained accuracy. Hydraulic feed as well as hydraulically operated brake and clutch provide automatic operation.

WORK IS EASILY HANDLED

. . . shell forging is inserted in lathe, tail stock live spindle traversed hydraulically to located shell on mandrel when spindle starts automatically through hydraulically operated clutch.

. . . carriage with slide controlled tools is moved hydraulically until outside of shell is completely turned; simultaneously, rear slide tools are moved hydraulically into shell for facing base and cutting off open end to length.

. . . on completion of turning, pilot valve is rotated automatically by trip dog which puts feeds in rapid traverse to return carriage and rear slide to starting positions.

. . . spindle is stopped automatically by hydraulically operated brake.

. . . pressure is released on expanding mandrel and traverse tailstock spindle by foot-operated valve on floor to permit quick recovery of turned shell.

CONDENSED FEATURES AND SPECIFICATIONS

Geared Head Stock—4 speeds.

Hollow forged steel ground spindle mounted on Double Row Timken Bearings.

Tool carriage heavily ribbed.

Longitudinal and cross feeds quickly changed by feed dials.

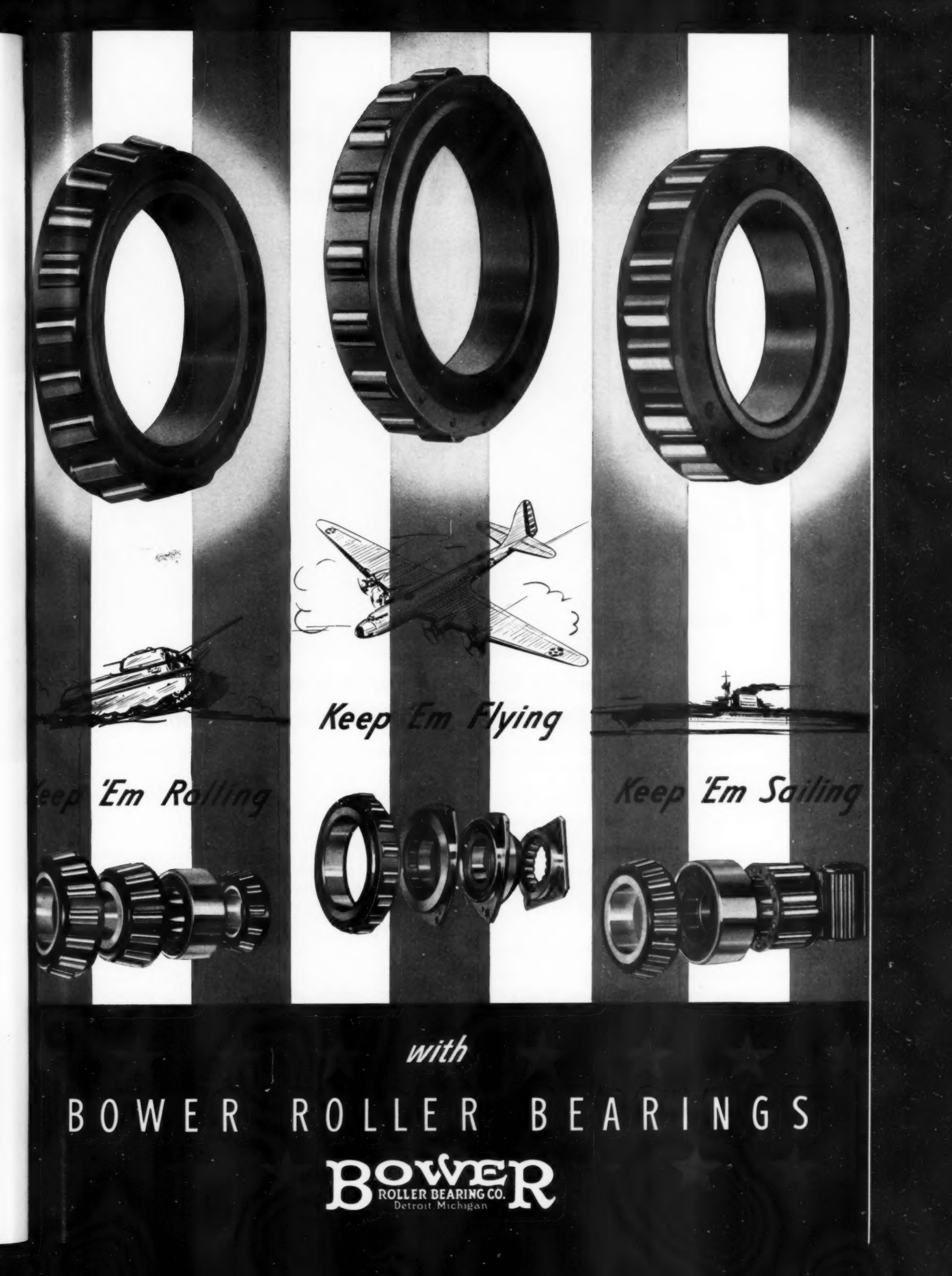
Main Motor drive through V-belt or silent chain.

Swing over ways: 21" Swing over carriage: 12".

WRITE AT ONCE FOR FURTHER DETAILS

SPARKS HYDRA-FEED LATHE

SPARKS MACHINE TOOL CORPORATION
NORWALK . . . . CONN.

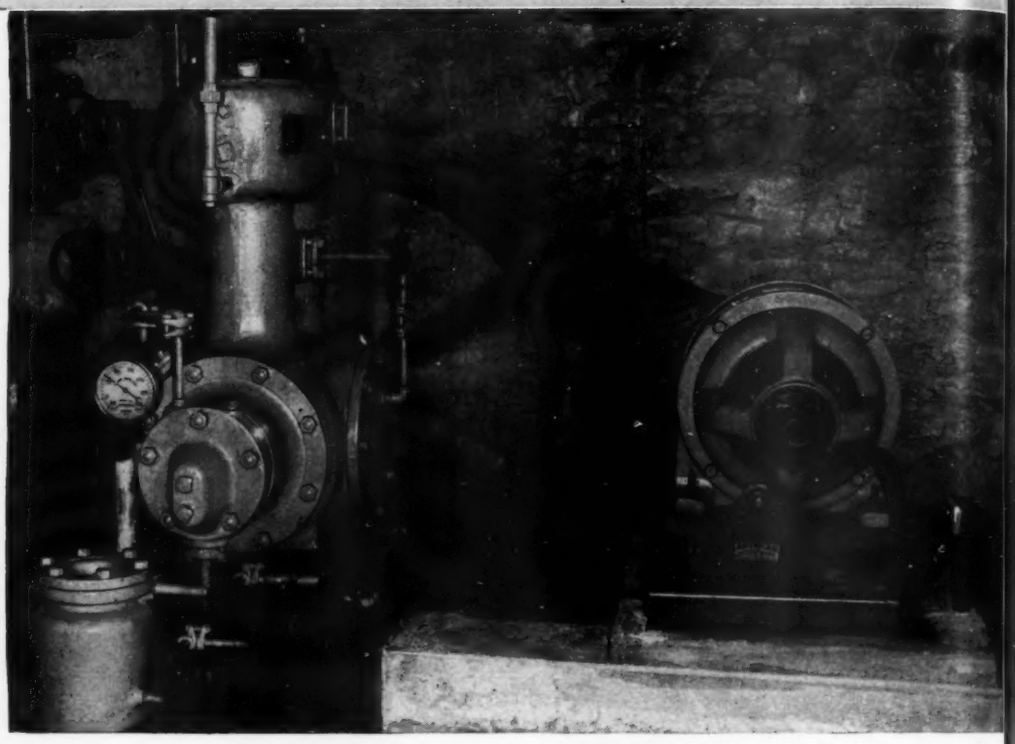


with

BOWER ROLLER BEARINGS

BOWER
ROLLER BEARING CO.
Detroit, Michigan

AMERICAN



☆ *Econ-O-Matic Drives Mean Automatic Economy*

American Econ-O-Matic* Flat-Belt Drive

"Wins Its Letter" at Cornell with a 67% Saving in Operating Cost!

"Far above Cayuga's waters", Cornell maintenance men put a problem up to the University's engineers.

Problem: A compressor drive with an idler was slipping badly . . . belt wear was excessive.

Solution: Cornell engineers installed an American Econ-O-Matic Flat-Belt Drive, with the unique American Motor Base that gives automatic tension control. Thus they eliminated the idler.

Result: Savings of 67% in operating cost—because:

1. Belt slip is eliminated.
2. Belt wear is reduced.
3. Increased bearing life.
4. Operation is quieter.
5. Compressor and drive are operating under load for shorter intervals.
6. Fewer man hours of maintenance are needed . . . with automatic tension control replacing manual adjustments.
7. Cooling efficiency of compressor is vastly improved.

Nine additional American Econ-O-Matic Drives have been installed at Cornell University, Ithaca, N. Y.

What You Can Expect from American Econ-O-Matic Drives

- Increased production because correct RPM level is sustained . . . no belt slip.
- Low first cost quickly saved in reduced power consumption.
- Man hours and materials required for maintenance reduced up to 75%.
- Belt iife increased by an average of 100%.
- Bearing pressure reduced by an average of 50%.

Let our engineers prove these economies to you!

THE *American*

4275 WISSAHICKON AVENUE

ECON-O-MATIC* DRIVES

AMERICAN Drive Selection Service

HELP WANTED

on Short-Center Drive Problems? Want the quickest and most efficient answer? Call for AMERICAN DRIVE SELECTION SERVICE. Our engineers and distributors are installing both Flat-Belt and V-Belt Drives every day in the year. They know which type is best suited for each operating condition. Send us your problem *today!*

American Econ-O-Matic* V-Belt Drive—

Saved over $1,000 in 3 Years for Metal Stampings Manufacturer!

At the plant of a leading metal fabricator, a large hydraulic baling machine was really expensive to drive . . . until American Pulley engineers were called into the picture.

Problem: To eliminate frequent shaft and coupling breakage on a direct-connected motor driving the baling machine; motor was started directly across the line. *Former equipment* included a 50 HP, 680 RPM motor connected to driving shaft of the baling machine by a flexible coupling and a clutch.

Recommendation: American Pulley engineers suggested that the machine be driven by a high-speed motor and an American **Econ-O-Matic V-Belt Drive.** Thus the clutch and coupling were entirely eliminated.

Total Cost for Change: $591.35—including $345.00 for a 50 HP, 1800 RPM motor; $194.35 for two Wedgbelt Pulleys, seven Wedgbelts, and a Tension-Control Motor Base; and a total installation cost of $52.00, including new electrical connections.

Result: Change made more than three years ago. Customer reports that no difficulty has ever been experienced with the American **Econ-O-Matic V-Belt Drive.** American Wedgbelts have shown exceptional life. Customer estimates savings of considerably over $1,000 by eliminating problems of broken shafts, couplings and gears.

This drive has saved more than five times its own cost . . . and double the cost of the whole installation, including the new motor . . . in only three years!

Pulley COMPANY
PHILADELPHIA, PA.

***Econ-O-Matic Drives** are short-center drives, either flat-belt or V-belt, with American Motor Bases for automatic tension control—and thus *automatic economy.*

Your Turret Lathe Problem

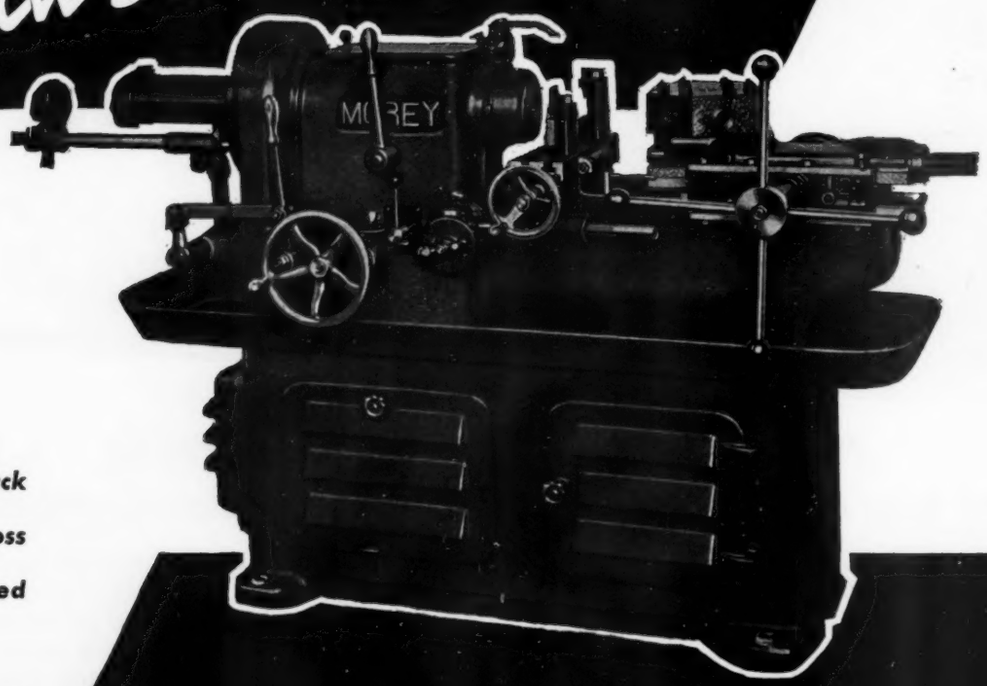
Solved! The MOREY 2G

1" COLLET CAPACITY

TURRET LATHE

Timken Bearing—Self-Locking Turret—Infinite Spindle Speeds

Quick Delivery



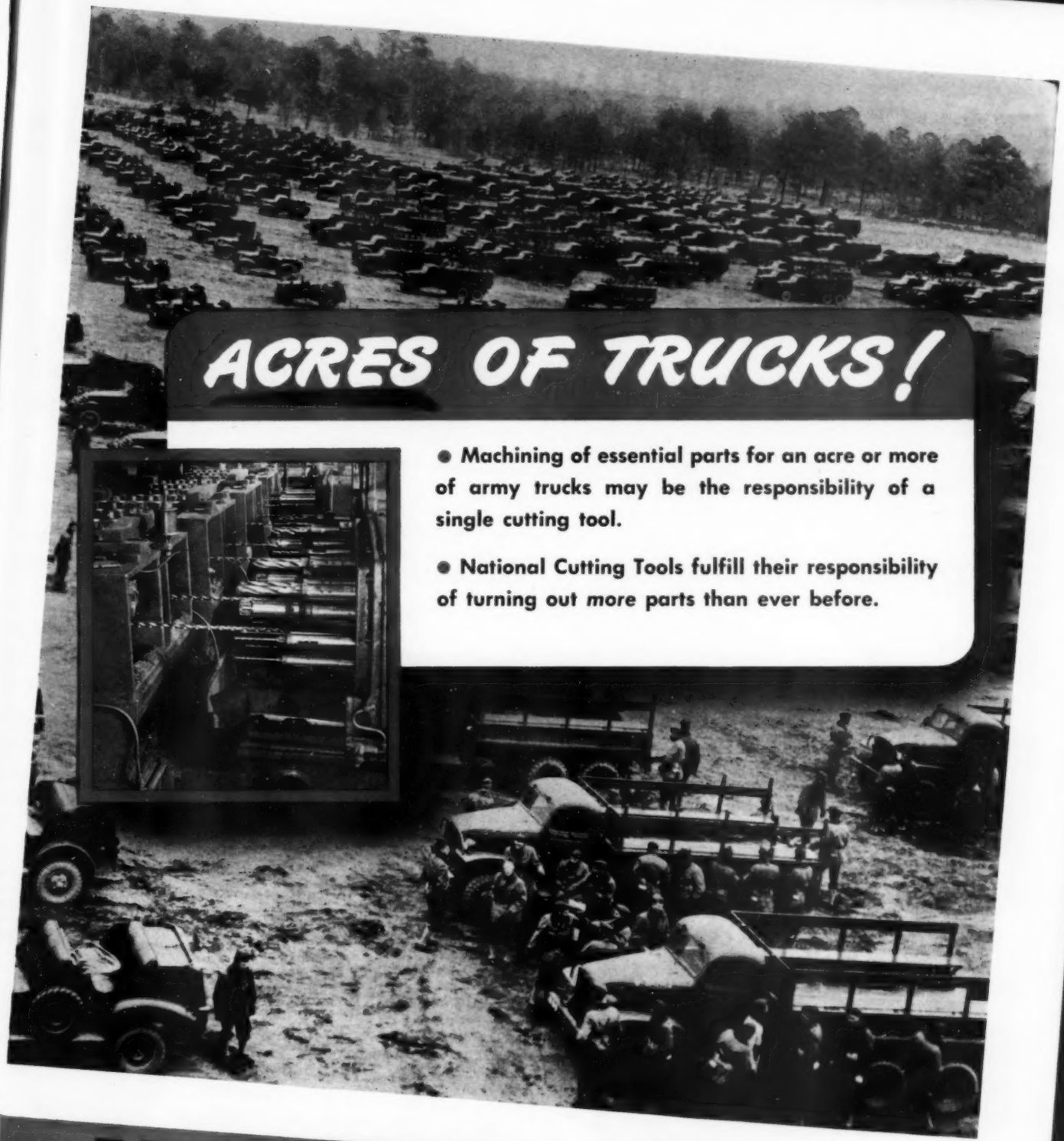
CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Full description and detailed illustrations are shown in Bulletin 629. Ask for it TODAY!

Join the parade of high speed defense producers with the MOREY 2G *Timken Bearing* Turret Lathe, with *Self-Locking Turret*. You are assured *vibrationless precision* with an *infinite variety* of spindle speeds for every job. It's designed to take full advantage of *high speed* and *carbide tools*. Back gears are instantly thrown in through *extra large* Twin Disc Clutch. *Can be furnished with Tooling!*

MOREY MACHINERY CO., INC

410 BROOME STREET • NEW YORK, N. Y.



ACRES OF TRUCKS!

- Machining of essential parts for an acre or more of army trucks may be the responsibility of a single cutting tool.
- National Cutting Tools fulfill their responsibility of turning out *more* parts than ever before.

NATIONAL

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

Home Office and Factory—DETROIT, MICH.
Tap and Die Division—Winter Brothers Co., Wrentham, Mass.
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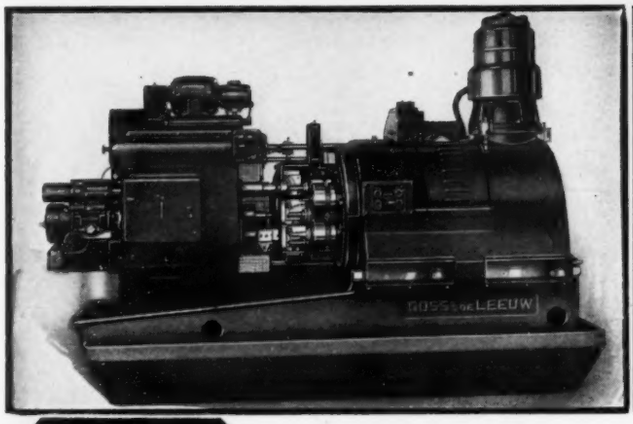
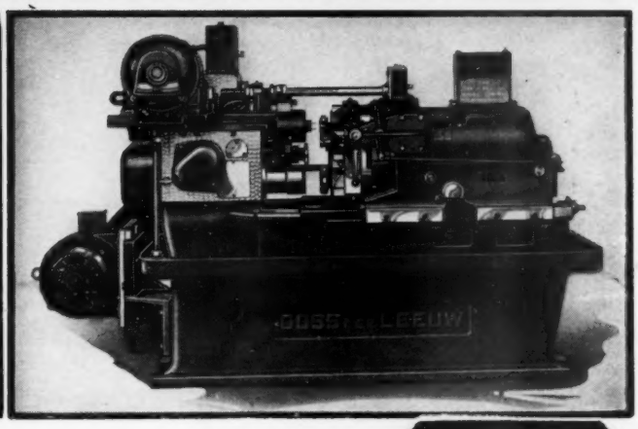
GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

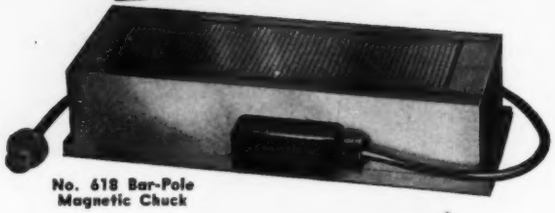
Lead Screw Threading on both types—Pre-loaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

WALKER MAGNETIC CHUCKS there's a WALKER for YOUR needs



No. 618 Bar-Pole Magnetic Chuck

Universal Swiveling Magnetic Chuck

You are sure to find the magnetic chuck that will exactly fit your requirements when you come to Walker. There's no guesswork because Walker makes all types and sizes, including Rectangular, Swiveling, Vertical Face and Rotary designs.

Then, too, you are assured of having magnetic chucks that are the product of long, specialized experience — chucks that are designed and built right for the specific service intended.

If you need special chucks for special purposes, Walker can supply them promptly and at reasonable prices.

You'll save time and money by specifying "Walker" on your next magnetic chuck order.

Style "D" Face Plate "Concentric Gap" Type

FULL DETAILS ON REQUEST

Ask for circular W-4

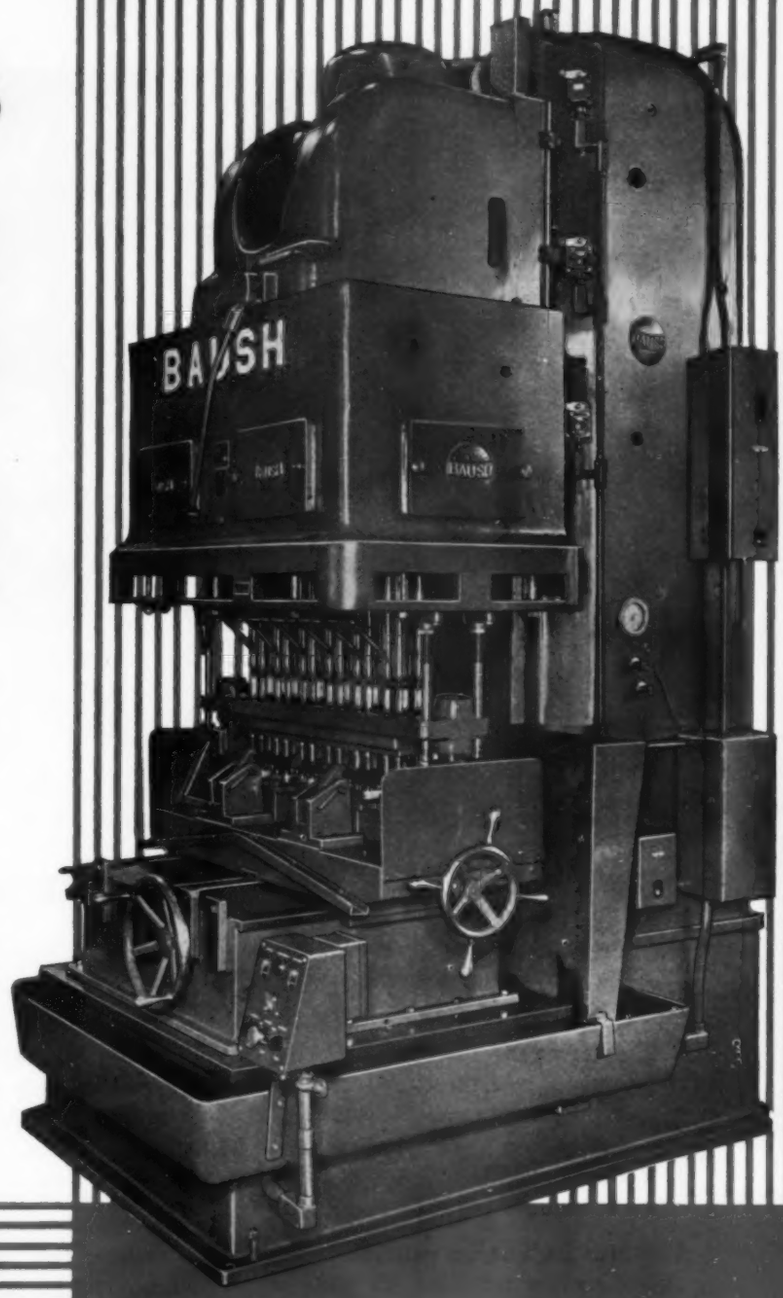
O.S. WALKER CO. INC. WORCESTER, MASS.

14 CYLINDER HEADS AN HOUR

Baush Reams Valve Guide Holes Quickly - Accurately - for Packard Rolls Royce Aircraft Engines

● **THE JOB**—to finish taper ream both inlet and exhaust valve guide holes in the aluminum alloy cylinder head of the famed Rolls Royce Merlin Aircraft engine.

● **THE MEANS**—A Baush W-7 hydraulic multiple spindle drilling machine. Its 24 spindles finish-ream the holes accurately—the inlet diameter .7900", the exhaust diameter .6775". And fast—14 parts an hour. This is only one of the drilling, reaming, boring and tapping operations which Baush machines perform at Packard. Mail the coupon now for further data.



BAUSH MACHINE TOOL CO. BAUSH SPRINGFIELD, MASS. U.S.A.

Universal Joints — Worm Gears

Baush universal joints are adapted to a wide variety of uses: drives, feed shafts, operating and adjusting mechanisms, many others. Baush worm gears, likewise, have many applications. Send coupon for further data.

Gentlemen:
Please send me ☐ Folder on Baush W type hydraulic multiple drilling machines, ☐ Baush universal joints, ☐ Baush worm gears.

NAME_____
COMPANY_____
STREET_____
CITY_____ STATE_____

BAUSH

MACHINE TOOL COMPANY

SPRINGFIELD, MASS. DETROIT, MICH.

MEANS BUSINESS

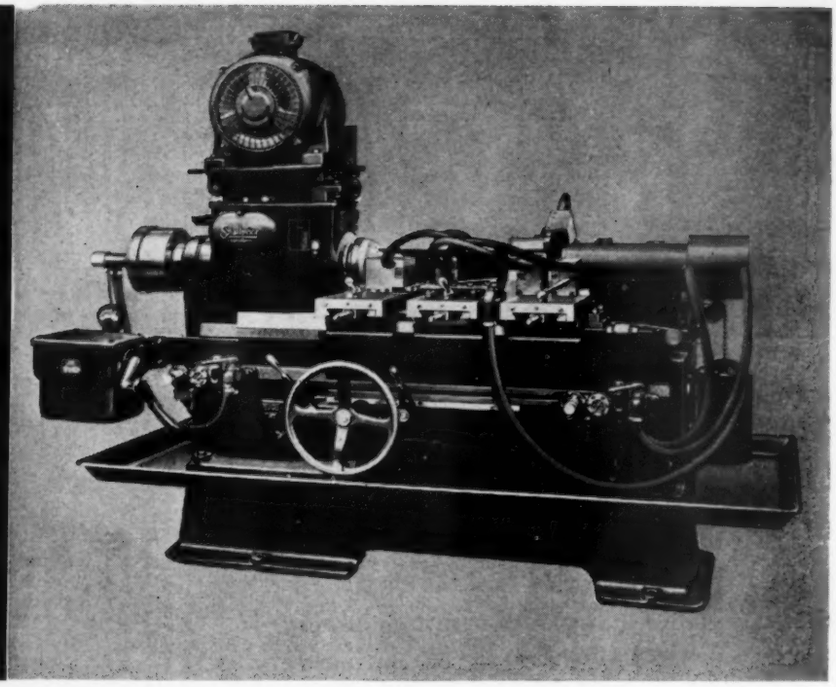
For over 45 years Baush has pioneered in multiple drilling . . . Expert engineering service available . . . Write today.

REID

SMALLPEICE MULTI-TOOL PRODUCTION LATHE

★

Versatile, Fast and Highly Productive



. . . on ARMAMENT WORK UP TO 58" between Centers and 18" Swing

This production lathe has the strength and power for heavy cuts at maximum speed and the versatility of many machines in the floor space required by a single machine.

Unit design provides for a wide range and variety of slides and attachments so that the Reid may be transformed quickly into a single purpose automatic. It may be adapted to special jobs and yet remain an all-purpose machine for regular turning, boring, facing and profiling. It is also a sturdy, practical center lathe for single purpose operation.

Features include an extremely rigid bed with long bearing surfaces; saddle mounted on wide ways and having tee slot for cross slides and other attachments; worm driven headstock; spindle mounted in taper roller bearings; Pulmore clutch for starting and stopping spindle; a wide range of feeds obtained by pick-off gears; front cross slide screw adjusted by graduated hand wheel with stop for accurate depth of cut setting.

Standard equipment includes air operated tailstock; screw operated front cross slide; cam operated rear cross slide; speed change gears; suds pump and splash guards.

A wide range of attachments are available to provide extra tooling facilities including equipment for automatic cycle operation.

WRITE AT ONCE FOR DESCRIPTIVE BULLETIN

Typical Applications

Special equipment is available for operations on the following typical classes of work.

SHELLS—Rough turning and facing; nose boring, finish turning; driving band groove forming and waving; driving band turning; turning base plates; final base facing.

SHAFTS—Short stub and long slender shafts.

GEARS—Machine all over on arbor.

GEARS, (RING TYPE)—Boring, facing and turning.

ROTORS—Skim turning.

VALVES—Facing and turning head; turning radius and stem

PISTONS—Skirt boring and facing; turning, grooving and facing

CYLINDERS — (AEROPLANE) — Rough and finish turning; forming fins

CRANKSHAFTS—Turning journals and ends

TEST PIECES—Turning, profile turning and forming

Outline your machining problem and ask for our recommendations.

BUILT IN TWO SIZES

	6 W.S.L.	9 W.S.L.
Swing over bed	12"	18"
Between centers	18"	22"
Admits between centers (long bed)	30"/42"/54"	40"/58"
Hole through spindle	1¾"	2-5/16"
Spindle speeds—low	52-362	19-258
medium	127-878	53-761
high	190-1320	109-1521
Feeds	10	15
Number of spindle speeds	10	8
Floor space	5'3"x3'0"	7'8"x4'0"

SMALLPEICE, LTD., 160 ELLIOTT ST., BEVERLY, MASS.

Manufactured in United States by **REID BROS. CO., Inc., Beverly, Mass.**

Engineered Productior

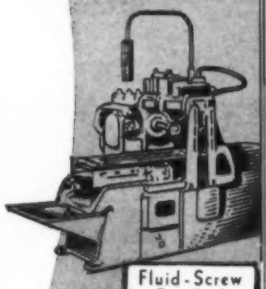
Quick Set-Up

Diagram shows how cycle of Sundstrand Automatic Lathe is set up quickly by adjusting dogs on graduated disc. Change-over is equally simple. There are no cycle-control cams to make, mount, or carry in stock.

No. 00 Rigidmil

No. 0 Rigidmil

No. 1 Rigidmil



Fluid-Screw Rigidmil

Sundstrand Solves Tough Production Problems

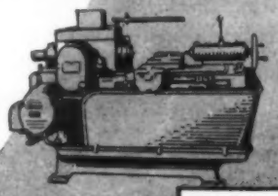
A Problem . . . Shaft shown above was being turned out on bar stock 1 7/8" diameter by 9" long in 30 minutes on modern machine tool. Higher production and economy were required . . . but machine and operator were already working to capacity. This, and turning in lots of only 200 at present, made a tough problem.

Solved . . . Engineered Production on Sundstrand Automatic Lathe solved this problem. Turning is divided into four successive operations. Set-up and change-over are so simple, cutting speeds and rapid traverse so fast, that total Sundstrand turning time is 15.8 minutes per shaft, saving 14.2 minutes each. Sundstrand automatic cycle makes operator's part of this job easier, frees 50% of his time for other work.

Plus Values . . . Nineteen other different work-pieces are turned on this lathe, with similar savings on all. Sundstrand tool relief reduces wear on front tools, eliminates drag marks. Sundstrand Engineered Production Service is available to all shops, small or large, to increase production, cut costs, and save labor on turning and milling. Investigate.

Get This Bulletin

You can learn quickly about advantages, features, cycles and specifications of Sundstrand Automatic Lathes by reading book shown above. Send for your copy today. Ask for Bulletin A-391.

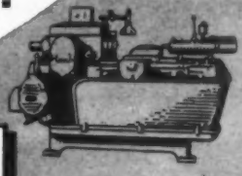


Model 12 Automatic Stub Lathe

Sundstrand Machine Tool Co.

2533 Eleventh Street, Rockford, Illinois, U. S. A.

Model 8 Automatic Stub Lathe



Model 10 Automatic Stub Lathe

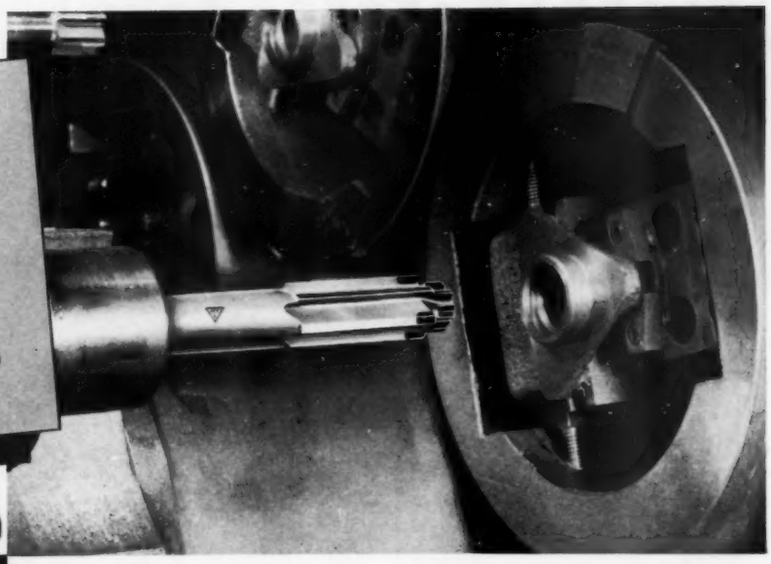
In their respective fields, Sundstrand machine tools are unexcelled for high production, accuracy, and lasting value. Write for complete details.

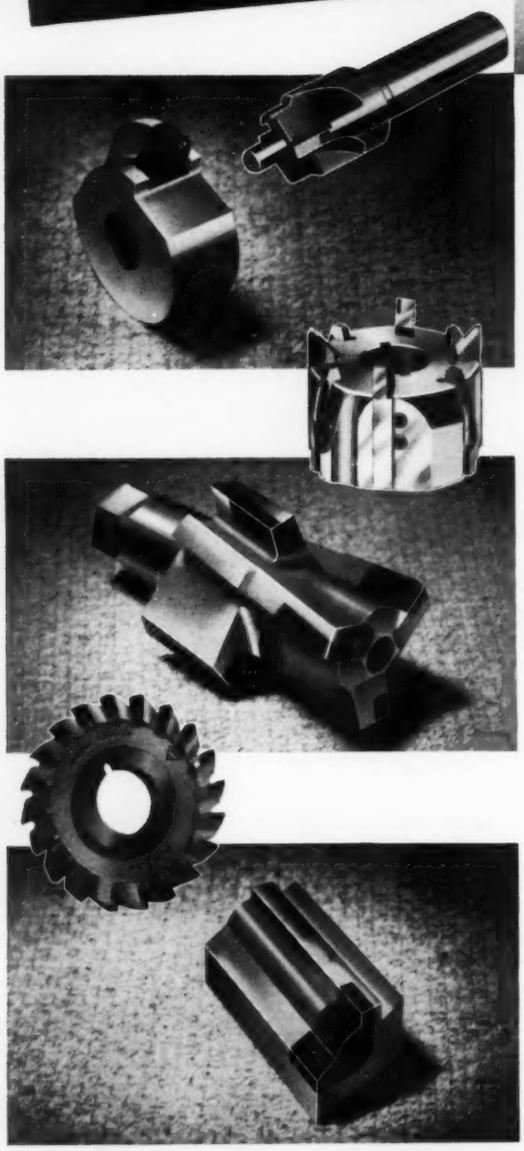
SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

RIGIDMILS · STUB LATHES

Hydraulic Operating Equipment — Drilling and Centering Machines

Special
CEMENTED-CARBIDE TIPPED CUTTING TOOLS





Produced *Exactly* to Your Specifications . . Delivered Promptly

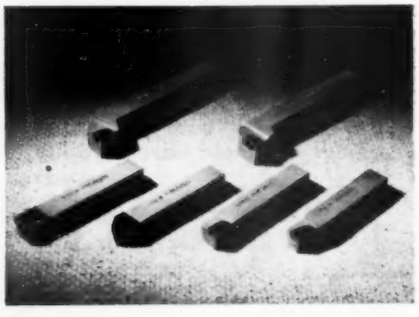
The Morse Tool Company, over the past few years, has manufactured thousands of special cemented-carbide tipped cutting tools. Wherever they have been used, they have done their job extremely well. For that reason, the demand for them necessitated the expansion of facilities to manufacture tools of this type. A new and entirely separate division was formed under the name of Carbide Fabricators.

Today, Carbide Fabricators occupies a modern, spacious plant in which all equipment is devoted to cemented-carbide work . . . providing the means to turn out tools of exceptional accuracy and quality and to eliminate long delays in delivery. We will welcome the opportunity to tell you how we can meet your requirements during the present War Program. Your inquiries (accompanied by blueprints) will receive prompt attention.

We are authorized suppliers of Carboloy, Firthite and Vascoloy-Ramet cemented-carbides.

And a Complete Line of Standard Tools

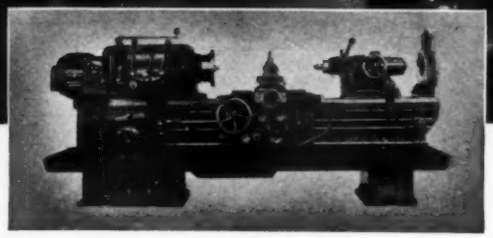
Carbide Fabricators stock a complete line of standard cemented-carbide tools. Pricing is simplified so that the same low unit cost prevails for tools ordered in any quantity. WRITE FOR OUR NEW CATALOG.



Carbide Fabricators BERKLEY MICHIGAN

DIVISION OF MORSE TOOL COMPANY . DETROIT

IT'S REALLY *ECONOMICAL* TO OWN AN *Axelson Lathe*

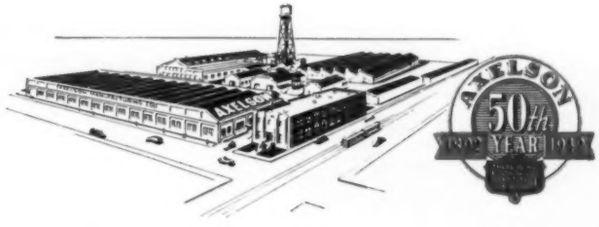


REAL ECONOMY is measured in performance records, not by the initial purchase price alone.

Reports from war material manufacturers and lathe operators all over the country say "it's real economy to own an Axelson Lathe" because three things are built into each Axelson Lathe essential to profitable machining operations. First, you can obtain a wide range of operating speeds and feeds necessary for fast production. Second, the accuracy and rigidity of Axelson Lathes has been established under all operating conditions. Third, they run smoothly year after year with minimum of maintenance and operating costs.

To sum it up—into each Axelson Lathe is built three essentials of satisfactory lathe operation—*speed, accuracy* and *minimum production cost.*

Remember, for over 25 years Axelson has manufactured lathes which have established for themselves a reputation for high quality.



WRITE TODAY *for* YOUR *copy of Axelson's latest lathe bulletin giving detailed information of sizes and specifications.*

Before you buy any lathe investigate AXELSON

DISTRIBUTORS

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"The next number will be free with 6 box tops, followed by occasional showers"

Doubletalk? No, it's how radio would sound if stations couldn't be kept on their assigned frequencies. The problem was licked once and for all when engineers discovered how to regulate radio frequencies with a tiny disc of quartz crystal, the thickness of which governs the length of the waves. Precision cutting, grinding and finishing of the quartz, a process Carborundum helped pioneer, makes today's accurate control possible.

No larger than a thumb nail, only about 1/16th inch thick, these oscillators must be finished to limits as close as 1/100th the diameter of a hair. With the aid of Carborundum Brand Abrasive Grains and Powders, the discs are made with optically flat and parallel surfaces, and thickness so accurate it must be measured in terms of light wave length.

In the development of many modern aids to living, abrasives have played a vital part. And Carborundum skill and knowledge have made much of this progress possible. Perhaps these facilities can help you solve your problem. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
REG. U.S. BRAND PAT. OFF.
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

ONE SNYDER SPECIAL AUTOMATIC-CYCLE MILLING MACHINE

Used for milling the radius contour of the bolt bosses on connecting rod caps. The machine has three spindles and three fixtures, for machining three parts at one time. The cutting cycle is fully automatic, being hydraulically operated and electrically controlled by push buttons.

ONE Snyder Machine doing the work of THREE

with unskilled help—in less floor space

You can use unskilled operators for high production milling, drilling, boring, turning and other work on Snyder machines because the cutting cycle is hydraulically operated and electrically controlled by push buttons. By combining or multiplying operations, Snyder machines give more production with fewer machines, require less skilled help and take less floor space. One unskilled operator can often tend several Snyder automatic-cycle machines, making skilled machinists available for setting-up and other work.

Snyder automatic-cycle machines are being used by aircraft, truck, ordnance and tank contractors and sub-contractors. Send for illustrated examples of problems solved by Snyder and use Snyder engineering experience and tooling facilities to solve your production problems.

SNYDER
TOOL & ENGINEERING CO.
3400 E. Lafayette Ave. • Detroit

designers and builders of machinery for **HIGH** *production at* **LOW** *unit cost*

BRIEF SPECIFICATIONS

10" swing; 24" between centers • Bed 6 15/16" wide by 43 1/8" long • Prismatic V and flat ways, hand scraped and honed • New Departure precision pre-loaded ball bearing headstock spindle • Thread cutting, 4-216 per inch • 25/32" hole through spindle, 1/2" collet capacity • 12 spindle speeds, 30 to 1450 revolutions per minute.

NO. 210 LOGAN BENCH MODEL BACK GEARED SCREW CUTTING LATHE ALSO FURNISHED IN FLOOR MODEL, NO. 200

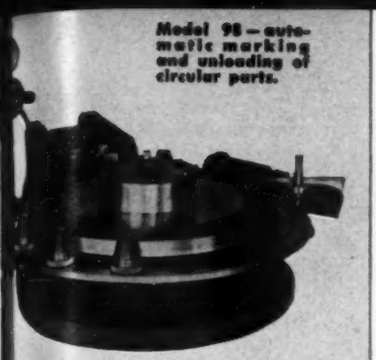
THERE IS ADDED VALUE IN A LOGAN LATHE

The Logan is primarily a good production tool built for the machine shop, requiring a rugged lathe of sustained accuracy. It brings many features heretofore incorporated only in larger equipment. The use of ball bearings in the headstock and a patented countershaft assembly — rubber mounted, with three point suspension and fully guarded, will definitely appeal to a production minded shop man.

LOGAN ENGINEERING COMPANY • Chicago, Illinois

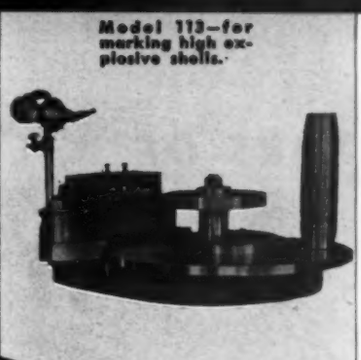
Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES



Model 98—automatic marking and unloading of circular parts.

Quick fuse parts.



Model 113—for marking high explosive shells.

Model 148—especially tooled for marking ends of munitions parts.

SAVE TIME*

WITH NOBLEWEST RAPID PRECISION MARKING EQUIPMENT

*TIME—*the most critical of all "materials"—an ingredient of every product—sold by no one—yet costly.*

Mark them faster - Mark them better - Mark them cheaper.

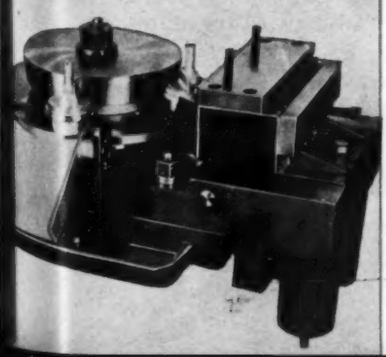
Noblewest rapid precision marking equipment saves valuable time by greatly increasing production speeds. The Noblewest improved rolling process permits such high speeds that users report up to 500% increases. Noblewest also gives you sharper, clearer, permanent impressions. Such features as automatic marking and unloading, pneumatic pressure, safety devices, interchangeable dies and work holding dials contribute to maximum efficiency and offer flexibility with a smaller investment. Tell us what you want to mark and let us make time- and money-saving recommendations. No obligation. Write today.

Model 157— the new, streamlined Noblewest rapid precision pneumatic marking machine. Shown tooled for marking socket wrench parts but may be tooled for many other marking and knurling applications, several of which are illustrated on this page.

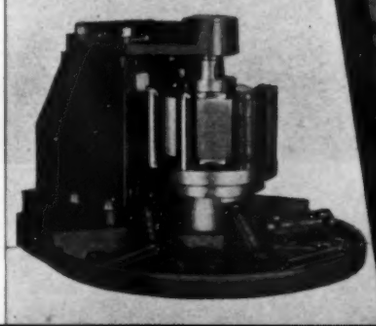
NOBLE & WESTBROOK MANUFACTURING CO.
Westbrook Street East Hartford, Conn.

☞ *MARK IT BEST WITH NOBLEWEST*

Model 115—tooled for marking fuse bodies.



Model 73—knurling and marking vulcanized fibre handle in one operation.



Noblewest marking machine at Picatinny Arsenal, tooled for high speed marking of shell fuse bodies.

FABRICATORS OF

LATHE PANS

GEAR GUARDS—SPLASH GUARDS—SPLASH PANS

Speed up "Defense Production" by having experienced fabricators produce your Lathe Pans, Gear Guards, Splash Guards, Machine Bases, etc. We have the facilities for making these units to fit your specifications. 60 years in handling plate and sheet metals is your guarantee for quality products. Lathe Pans of all sizes and shapes are easy for us to make in our modern shop.

LITTLEFORD BROS., INC.
434 E. Pearl St.
Cincinnati, Ohio

SEND BLUEPRINTS FOR PRICES!

LITTLEFORD

LITTLEFORD BROS., INC., CINCINNATI, OHIO

OSTER NO. 601 SIMPLIFIED TURRET LATHE

The "Jeep" and the Oster No. 601 machine have a lot in common. Both are versatile, easy to handle, quick-acting, ruggedly built, low in cost and high on performance. Both meet vital war needs NOW and assure wide use in the post-war future.

Batteries of Oster No. 601's in Action on Shell Contracts!

First and second operation jobs on 20, 37, and 40mm shells are now being handled by Oster No. 601 Turret Lathes. The manually controlled, six-position turret makes it easy to train new men rapidly. *Highly skilled operators not required.*

Cost? Without tools, the Oster No. 601 costs less than $2000.00. *Delivery?* In 12 weeks or less! *But act NOW to assure prompt scheduling of your order!*

QUICK DESCRIPTION OF THE OSTER NO. 601 SIMPLIFIED TURRET LATHE

Motor driven (2 H.P. two-speed motor). Designed with hand feed to cross slide. Equipped with manually operated 6-position turret; or with plain saddle (where three or fewer operations in sequence are to be performed.)

Two optional types of drive: WORM DRIVE (for making heavy forming cuts at relatively slow speeds); DIRECT DRIVE (for small diameter work or for non-ferrous metals at speeds up to 3000 R. P. M.)

Automatic chuck capacity: 1-1/2" round bar; 1-1/16" square bar; 1-5/16" hex bar. Swing over bed: 14". Swing over cross slide: 6-1/2". Carriage travel: 11" when there is a cross slide on 33" main ways. Maximum movement of screw feed cross slide is 6-1/2" and 4-1/2" for lever feed cross slide.

OSTER

Let's GO!

THE OSTER MFG. CO. • 2049 East 61st St., Cleveland, Ohio

Rush, by return mail ..... copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

NAME .....

ADDRESS .....

CITY ..... STATE .....

PLEASE SHOW THIS TO THE MAN WHO ORDERS YOUR CHUCKS . . .

TIMELY SUGGESTIONS

. . . for chuck users. Published by The Cushman Chuck Company in the interest of better service during the National Defense emergency.

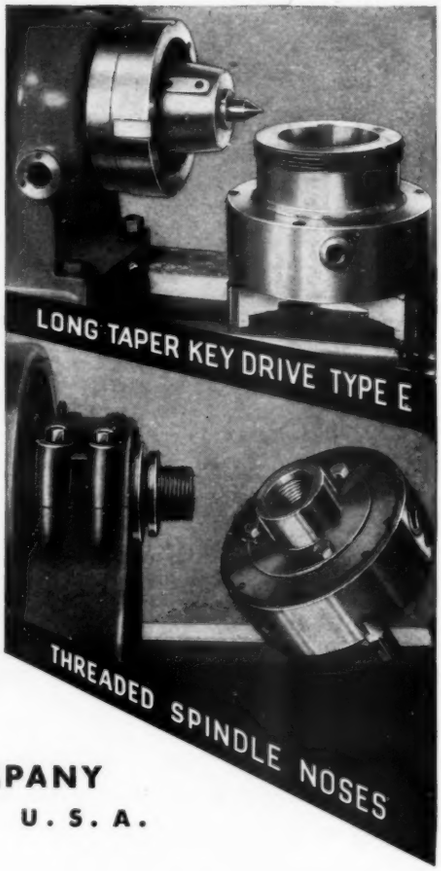
CUSHMAN has cooperated with all leading machine tool builders in developing chucks for the four types of lathe spindle noses shown on this page . . . all of which types are now represented in the equipment of essential war industries.

Because so many urgent orders continue to come to us ***without*** the necessary designation of spindle nose type, and because, in some cases, this has resulted in serious delays, we are using this space to again illustrate the spindle noses and to urge all chuck users to make sure that the following information is given on their orders

1. Required Chuck Size and Type
2. Spindle Nose Size and Type
3. Required Jaw Equipment

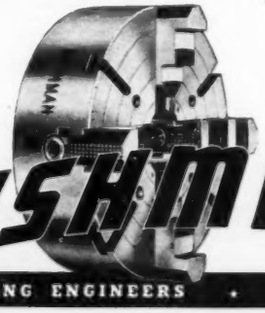
For example: Specify, "One Cushman Medium Duty 10" 4-jaw Independent Chuck for 8" Type A-1 Spindle Nose. Equipped with one set 2 pc. Reversible Jaws."

Naturally, it will save both words and time if you will keep your Cushman Catalog handy when ordering, and use either the code word or catalog number. We will be glad to send you a copy on request.



THE CUSHMAN CHUCK COMPANY
HARTFORD, CONNECTICUT, U. S. A.

A WORLD STANDARD FOR PRECISION



CUSHMAN

CHUCKING ENGINEERS • SINCE 1862

HYDRAULIC
HILL
SURFACE GRINDERS

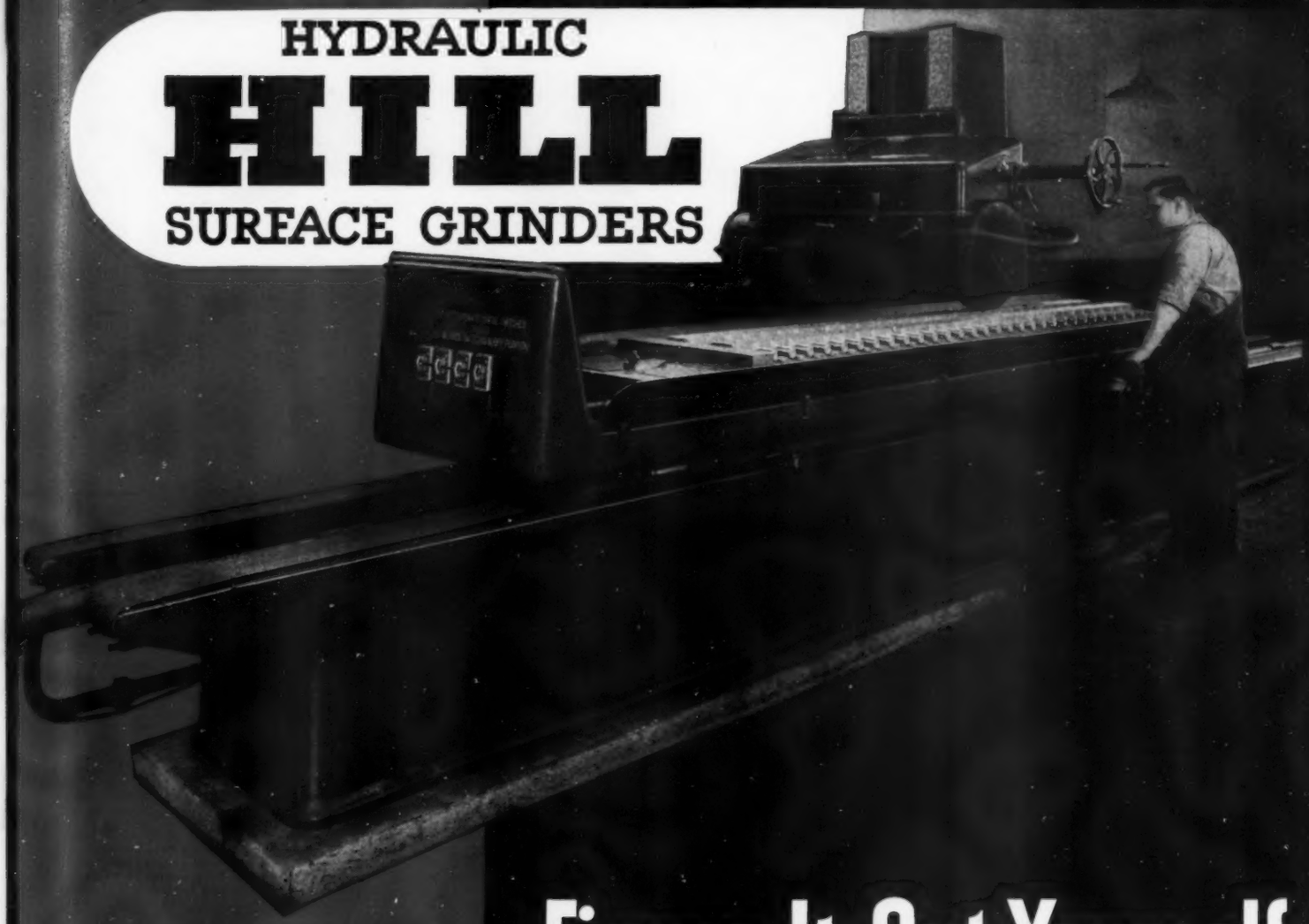


Figure It Out Yourself

This new bulletin tells the story. Send for it!

● Here is a typical installation of a HILL *"Open Side"* Horizontal Spindle Hydraulic Surface Grinder equipped with a HILL rectangular magnetic chuck. The operation consists of finishing special analysis steel yokes on four sides. Former average milling machine time on this operation was 20 minutes each. Present average grinding time, with the HILL Hydraulic Surface Grinder, is three minutes from floor to floor. . . . The HILL magnetic chuck accommodates 62 yokes at each loading. Yes, that's a tremendous increase in production and an impressive savings in manufacturing costs. (Table sizes—18", 24", 30" wide and 5 to 20 feet long). . . . Why not find out what a HILL Horizontal Spindle, or a HILL Vertical Spindle Surface Grinder can do for YOU?

The HILL ACME CO.

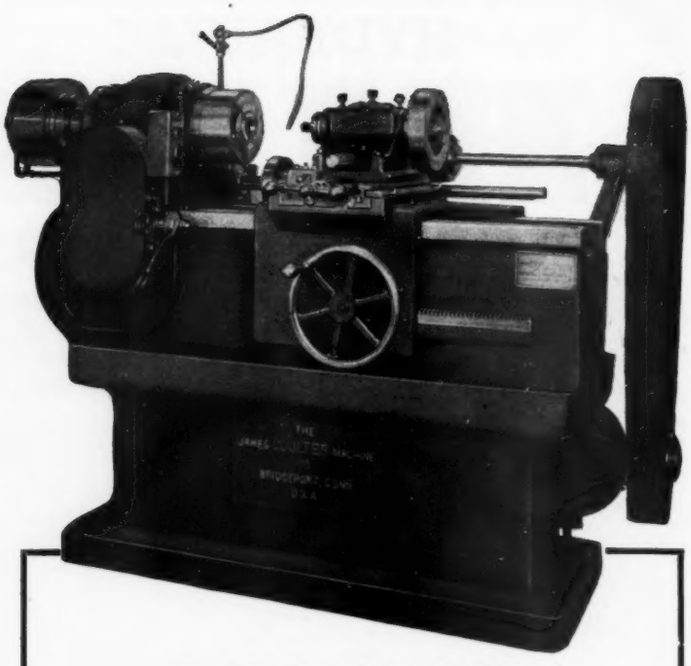
A consolidation of two nationally known, fifty year old manufacturers:—The Hill Clutch Machine & Foundry Company . . . and The Acme Machinery Company
6400 BREAKWATER AVE., CLEVELAND, OHIO

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

WILLARD Spring TOOL HOLDERS

FINER QUALITY WORK AND FASTER CUTS—ASSURED WITHOUT CHATTER OR DANGER OF TOOL BREAKAGE . . . . . .

Willard Tool Holders have been specially developed to save time and insure precision on high production repetitive work such as that demanded in shops busily engaged in AUTOMOTIVE, AIR CRAFT and DEFENSE MANUFACTURING.

They are available for a wide number of operations and hold tools securely against chatter. Cutter breakage is eliminated and the possibility of damaged work reduced to a minimum.

PROMPT DELIVERIES

Write today for descriptive folder which gives details on Willard Tool Holders for Forming, Threading and Forming Tools, Cutting Off Tools and Threading Tools.

Cutting-off Tool Holders reduce cut off time in half over solid tools. Spring feature makes faster feeds and heavier cuts safely possible.

Forming Tool Holders—adapted to a wide range of work in lathes, shapers and screw machines. Any number of cutters can be used in the same holder.

Forming Tool Holders — with straight and right hand offset—for holding ground high speed cutters. Fast, smooth cutting assured free from cutter marks. Ratchet design prevents cutter from turning under heavy feeds.

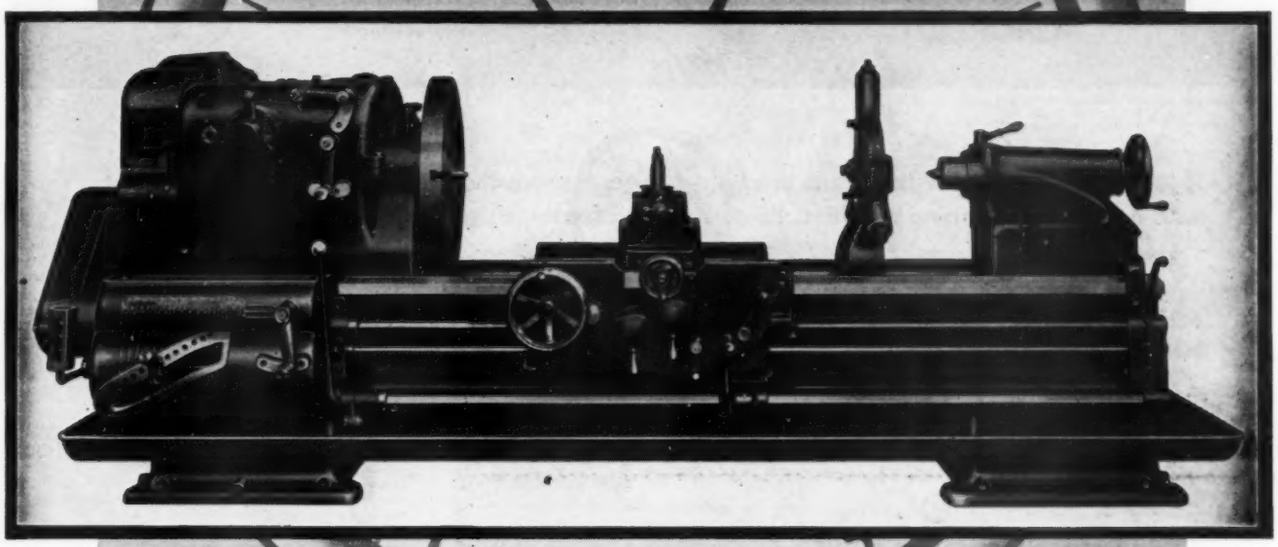
Product of AUTO-ORDNANCE CORPORATION

Manufacturers of THE THOMPSON SUBMACHINE GUN

TRADE-MARK Thompson REG. U.S. PAT. OFF.

1437 Railroad Avenue
BRIDGEPORT, CONN.

Work twice around the clock WITH SPRINGFIELD GEARED HEAD LATHES



● The current war production program calls on every manufacturer to do his utmost in meeting present day requirements, even if it means working 24 hours a day, seven days a week!

Under these circumstances, then, it's easy to see that your tools will get little, if any rest . . . . that they must produce *accurately, swiftly* and *safely,* without time-off for repairs due to structural faults or breakdowns. Ideal, then, is such a situation for SPRINGFIELD Geared Head Lathes' superior qualities of both construction and design.

Don't hesitate in letting SPRINGFIELD's carry your production load. All along the bed, from headstock to tailstock, they excell in basic materials, gearing arrangements, attachments, lubricating systems and power transmission. Sizes, too, are completely varied . . . there's one to meet almost every requirement.

Get this "twice-around-the-clock" service that SPRINGFIELD offers. Make every hour of the day more productive and less costly as to lathe maintenance and upkeep. A letter today will bring complete SPRINGFIELD Geared Head Lathe price and size specifications. Write!

The SPRINGFIELD MACHINE TOOL Co.

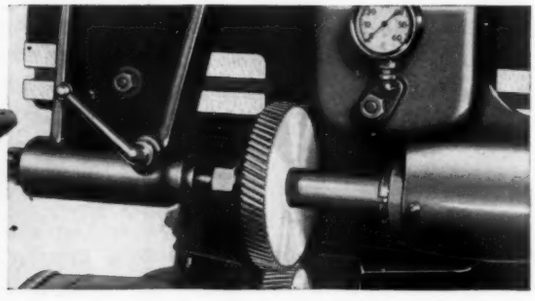
SPRINGFIELD OHIO U.S.A.

Correct Heat Treat Distortion and Gear Tooth Roughness by

RED RING LAPPING

If lapping is one of the processes used in your gear production, you can save time and cost with a Red Ring Lapping Machine. Its outstanding features are:

1. Minimizes rejections by correcting heat treat distortion and eliminates gear noise.
2. Applicable to spur and helical gears, cluster and shoulder gears.
3. Extremely fast—one minute for a 4″ gear with 1″ face when reasonably well cut and heat treated.
4. Provides for either Cramp or Power Tail stock lapping processes.
5. Fully adjustable automatic cycle under hydraulic and electrical control—operator need have no special skill.
6. High production laps—lap life 1500 to 3000 units when recut twice.
7. May be used on high or low involute teeth and also on the Elliptoid Tooth Form.



Write for descriptive literature.

SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

5600 ST. JEAN·DETROIT, MICH.

FREE INFORMATION FOR YOUR METAL-WORKING LIBRARY

New Catalogs, Booklets, Bulletins

METAL-WORKING EQUIPMENT

PLANETARY MILLING — Gordon-R Company, Royal Oak, Mich. 6-page illustrated folder, describes planetary milling for expediting thread milling and form milling operations. Specially designed fixtures enable identical operation cycle to be performed speedily and accurately, with minimum of attention. Specifications and features with operational information and typical jobs. More parts, less rejects at lower costs.

2 METAL-WORKING INFORMATION —E. F. Houghton & Co., Philadelphia, Pa. 33-page booklet has articles on machining magnesium alloys, some common heat-treating defects, rifling 20-mm. cannon, cleaning machine gun barrels after proof firing, and production briefs. Also describes Houghton line.

3 PRODUCTION LATHES—Reid Bros. Co., Inc., Beverly, Mass. 12-page generously illustrated catalog on small piece multi-tool production lathe describes unit design and construction that makes it versatile and productive. Specifications and action photographs detailed and informative.

4 MULTIPLE PRECISION GRINDING —Fitchburg Grinding Machine Corp., Fitchburg, Mass. 4-page illustrated folder on special applications to speed mass production with Fitchburg bowgage self-contained automatic grinding wheel units by multiple precision grinding on gun barrels and spindles. Diagrams show operation.

5 GEAR GENERATORS—Fellows Gear Shaper Co., Springfield, Vt. 14-page folder on straight line gear generator for cutting spur and helical fine-pitch gears. Gives detailed information on parts of machine and valuable gear formulas. Provides operational data and diagrams valuable to users. Has specifications and table for tooth proportion on fine-pitch gears.

6 TURRET LATHE—South Bend Lathe Works, South Bend, Ind. 4-page illustrated bulletin 67-T describes No. 2-H turret lathe with specifications and construction features. Adaptable to long run or small lot production on wide range of bar, chucking and fixture jobs.

TOOLS AND ACCESSORIES

7 MILLING HEADS—H. Leach Machinery Co., Providence, R. I. Illustrated folder describes Maxi-Cut milling head for economy and production. Operates on all types of milling, drilling, boring and facing operations. Gives accurate and fast machining in making of tools, dies, jigs, fixtures and patterns.

8 GAGE BLOCKS—Webber Gage Co., Cleveland, O. 4-page folder on precision gage blocks describes sets available, and what they contain, with prices on them and individual replacement blocks.

9 CARBIDE TOOLS — Vascoloy-Ramet Corp., North Chicago, Ill. 28-page general catalog and price list has illustrations and diagrams listing 22 typical styles of single-point tools, together with grade selector charts for steel, cast iron and abrasive material. Includes instructions for ordering tools and blanks and tables for computing cost.

10 DRILLS & REAMERS—Whitman & Barnes, Detroit, Mich. 32-page booklet "Drill and Reamer Facts" describes and illustrates design and construction of twist drills, correct drill pointing, and use and care of drills. Gives recommended speeds and feeds, cutting compounds and types of drill points for drilling various materials. Data on tap drill sizes and basic thread dimensions, hardness conversion table, dimensions of taper shanks and sockets, decimal equivalents of fractions, letter, wire gage and millimeter sizes, etc.

For Your Convenience

Two business-reply cards are printed here. On each is room for you to request four pieces of literature.

How to Order

1. If you are requesting four pieces or less, please use only the bottom card. Likewise, for five to eight pieces, use both cards.

2. Be sure to fill one space for each piece you order. This will assure your receiving copies of literature promptly by reducing clerical work in handling your requests.

3. When you have filled out one space for each catalog or bulletin you want, detach along the scored lines and drop the cards in the mail. No postage is required.

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These cards not good after June 1, 1942

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11 AIR CLAMPS—Mead Specialties Co., Chicago, Ill. 4-page folder shows how air clamps will revolutionize drilling procedure and jig design. Illustrations show all-around utility. Shows how to speed up milling operations.

12 CARBIDE TOOLS — Carboloy Co., Inc., Detroit, Mich. 8-page, illustrated catalog GT-140, covers line of standard tools with new prices, and gives all styles and types available. Includes drawings and tables showing major specifications and tool angles. Number of typical adaptations of standard tools for special machining requirements given.

13 SUPERFINISHING STONES—Mid-West Abrasive Co., Detroit, Mich. 4-page illustrated folder on precision in metal finishing with micro-bond superfinishing stones describes advantages and uses. Includes guide charts for selection of proper superfinished stone for steels of known hardness.

14 CARBIDE TOOLS—Morse Tool Co., Detroit, Mich. 4-page folder lists all standard cemented carbide tools and gives exact information required when ordering. Charts of sizes and specifications.

15 AUTOMATIC FEEDS—F. J. Littell Machine Co., Chicago, Ill. 39-page illustrated catalog 42 on automatic feeds for punch presses gives complete details and specifications with examples. A wide variety of operations described. Valuable reference on automatic feeds of all types.

16 CARBIDE TOOLS—Willey's Carbide Tool Co., Detroit, Mich. 8-page illustrated bulletin 142, gives grades and classifications of Willey's metals supplied on tools and tips, and description of standard tools with charts for ordering. Data on torpedo-type wheel dressers and double-edge carbide tool grinders.

17 GRINDING WHEELS—Bay State Abrasive Products Co., Westboro, Mass. 64-page illustrated booklet "Valuable Facts About Bay State Grinding Wheels" has data on grinding wheels and abrasive shapes. Gives various abrasive grains and bonds available. Complete reference for grinding machine operators.

18 PORTABLE TOOLS—Skilsaw, Inc., Chicago, Ill. 45-page catalog 43, gives description and uses of wide variety of portable tools for all operations with specifications and prices. Handy reference.

19 SPECIAL TOOLS AND GAGES—Merz Engineering Co., Indianapolis, Ind. 15-page catalog describes organization built up for engineering and production of precision parts, gages, jigs and special machine tools. Interesting description of activities and operations in precision engineering organization.

20 PORTABLE ELECTRIC TOOLS—Wodack Electric Tool Corp., Chicago, Ill. 8-page illustrated folder describes with specifications electric drills, hammers and drills, and grinders. Also accessories for Wodack electric tools.

HEAT-TREATING AND WELDING

21 FLAME CUTTING TIPS—Air Reduction Sales Co., New York, N. Y. 8-page illustrated booklet describes high-speed machine cutting for increasing speed of flame cutting 20 to 30 percent. Picture presentation of "45", shows revolutionary design features. Many new facts and figures describes in text and chart form.

22 LOW TEMPERATURE WELDING —Eutectic Welding Alloys, Inc., New York, N. Y. 32-page illustrated catalog gives technical data on low temperature welding with Castolin Eutectic alloys and fluxes, with oxy-acetylene torch, gas, furnace or arc welding. Valuable data to all those interested in these new developments.

23 ELECTRIC FURNACE BRAZING—Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. 8-page illustrated folder, "How to Cut Production Costs with Electric Furnace Brazing," gives examples showing percentage savings over previous methods. Check list for possible savings by furnace brazing. Describes metal suitable for this process.

PLANT-SERVICE EQUIPMENT

24 WASH FOUNTAINS — Standard Washroom Equipment Co., Saginaw, Mich. 4-page illustrated folder on Mercury Stone Wash Fountains describes advantages. No splash spray, smooth, safe polished surface, sturdy reinforced base, all plumbing easily accessible, individual spray control, and water-saving leg control.

25 CONVEYORS — Standard Conveyor Co., North St. Paul, Minn. 8-page illustrated folders describes standard conveyors for ammunition plants, foundries, steel and brass mills, and aviation machine shops. Has action photographs and gives information on advantages through stepped-up production.

26 STEEL FACTORY EQUIPMENT—Standard Pressed Steel Co., Jenkintown, Pa. Catalog describes in detail with illustrations and complete specifications steel work benches and steel factory equipment. Shop furniture for all uses with prices given.

PARTS AND MATERIALS

27 STAINLESS STEEL FLUX—Helmer-Staley, Inc., Chicago, Ill. 4-page folder on Lloyd's Stainless Steel Liquid Flux for use in soldering a number of alloys, gives information on how this method is superior. Stronger bond, faster work, difficult jobs made easier, and less solder used.

28 MOTOR CONTROLS—Arrow-Hart & Hegeman Electric Co., Hartford, Conn. 115-page illustrated catalog 9 on Motor Controls is complete and detailed, incorporating all information and prices on complete line.

29 ALUMINUM — Aluminum Co. of America, Pittsburgh, Pa. 50-page catalog on impact extrusions and pressings of aluminum has large illustrations and diagrams showing methods used and results obtained. Finished products shown and engineering data on them given.

30 LOCKNUTS—Palnut Co., Irvington, N. J. 12-page folder has illustrations and diagrams showing exclusive double-locking action of Palnuts and advantages. Also application data and dimensions with available sizes, materials and finishes.

31 COOLANT PUMPS—Eastern Engineering Co., New Haven, Conn. 8-page folder describes construction features of pumps and models offered with charts of capacities and mounting instructions.

32 PORTABLE COOLANT PUMP—Gray-Mills Co., Chicago, Ill. 6-page illustrated catalog shows various examples of application and describes coolant pump and how it may be adapted to use with many machines.

33 STEEL STOCK LIST—Joseph T. Ryerson & Son, Inc., Chicago, Ill. 268-page catalog data book lists more than 11,000 different kinds, sizes and shapes of steel bars, shapes, plates, sheets, tubing, cold finished, alloy, tool and stainless steels normally carried in stock. Valuable reference.

34 PLURAMELT — Allegheny Ludlum Steel Corp., Pittsburgh, Pa. 4-page folder on how Pluramelt conserves vital alloys. Detailed description shows how less stainless can be employed and still serve same uses. Of vital interest to all stainless steel users.

FIRST CLASS
PERMIT No. 10
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NEW YORK, N.Y

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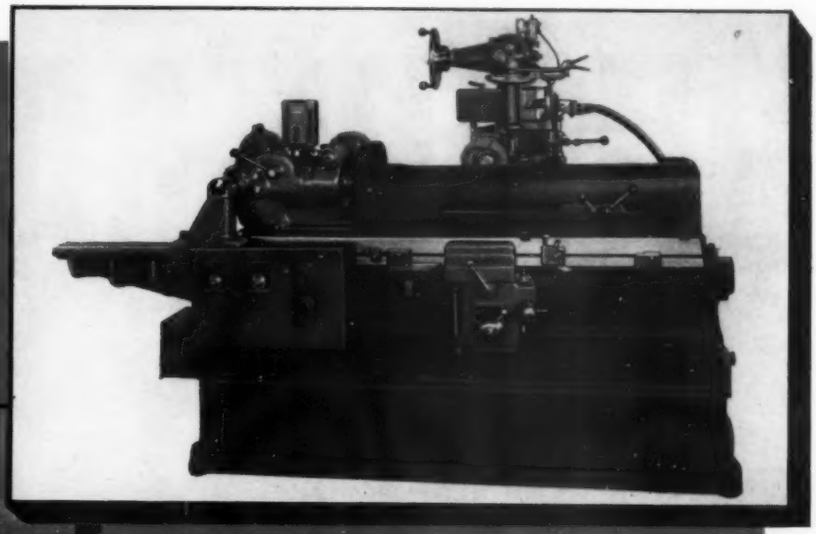
FITCHBURG

Automatic Closed Cycle Grinding



Assures

ACCURATE SPLINES

Fitchburg formed wheel grinding method with automatic closed cycle, produces splines and gears with finer finish — higher degree of accuracy — higher speed in operation, resulting in smoother product performance.

Fitchburg technique also permits new operators to be quickly trained to produce accurate work — an important factor in speeding war production.

Fitchburg Grinding Equipment is in successful use in the largest industrial plants in the United States. Every day it is saving man hours.

If you have any work of this character let Fitchburg engineers show you how to speed production by this modern grinding method.

Write today for this catalog showing wide range of successful operations.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

THOMPSON *Builds Immense*

A COMPARISON

Here's the latest in Tool Room Grinders. Its high speed — ability to work to limits of less than .0001 and versatility place it in a class of its own. This 6" x 18" Surface Grinder presents a striking comparison to the machine below. Bulletins on all standard machines immediately available.

THE Thompson GRINDER

SURFACE GRINDER

• This immense Surface Grinder built recently by THOMPSON has an overall length of 43 feet and weighs 88,000 pounds. The table is 30″ x 220″ work surface. Machine has 28″ vertical capacity under the 20″ wheel. Seven motors are used for the various functions of the machine and represent a total of 65 H.P. The magnetic chucks alone weigh 4½ tons. The wheel is 20″ x 6″ with 12″ hole and is driven with a 30 H.P. motor. Pressure lubrication is furnished to spindle and table bearings.

With all its size and weight the machine has full hydraulic control and responds instantly to the operator's touch — due to the finger tip high pressure control to head and table movements. Note also that all controls are centralized and located at convenient height for average operator.

Here then is a huge Thompson Grinder with all the advantages of speed, accuracy and dependability expected of smaller units.

Complete detailed description upon request.

R COMPANY, *Springfield, Ohio*

DON'T THROW AWAY YOUR BROACHES or REAMERS Because they are a LITTLE UNDERSIZE

Use the SUNNEN "MA" Precision HONING MACHINE to take out that Last Thousandth or so . . .

Reamers and broaches are expensive — and hard to get! Don't discard them simply because they are a little undersize. Go ahead — use them as long as you can — and remove that last thousandth or two with the Sunnen "MA" Precision Honing Machine.

Leading defense manufacturers the country over are using this inexpensive machine to accurately finish internal cylindrical surfaces from .185" to 2.400". Accuracy within .0001" is guaranteed and has often been held to .000025" in production work.

Solves Five Important Problems

1. Corrects errors of out-of-roundness and taper caused by previous operations.
2. Produces super-smooth surface finishes.
3. Accurately finishes holes to very close tolerances both as to size and straightness.
4. Maintains alignment already established by previous operations.
5. Provides simple, low cost method for accurately duplicating sizes.

Relieves Big Internal Grinders—Can Be Set Up in a Minute—Does Not Require Skilled Labor

Fast — not only in production, but can be set up and work located in a minute. Any intelligent workman—or girl—can produce precision work with only a few hours' practice. You can shift your highly skilled labor to other jobs.

Write for FREE *Bulletin*

giving complete information and showing many examples of use. Or if you prefer, we'll have a sales engineer call and demonstrate this equipment in your plant, on your job.

SUNNEN

Molded Composition (Bakelite) Pulleys. Molded composition is a difficult material to machine but it can be easily honed to a smooth finish.

Drawing and Blanking Die "Saves time in producing smooth base metal finish."

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

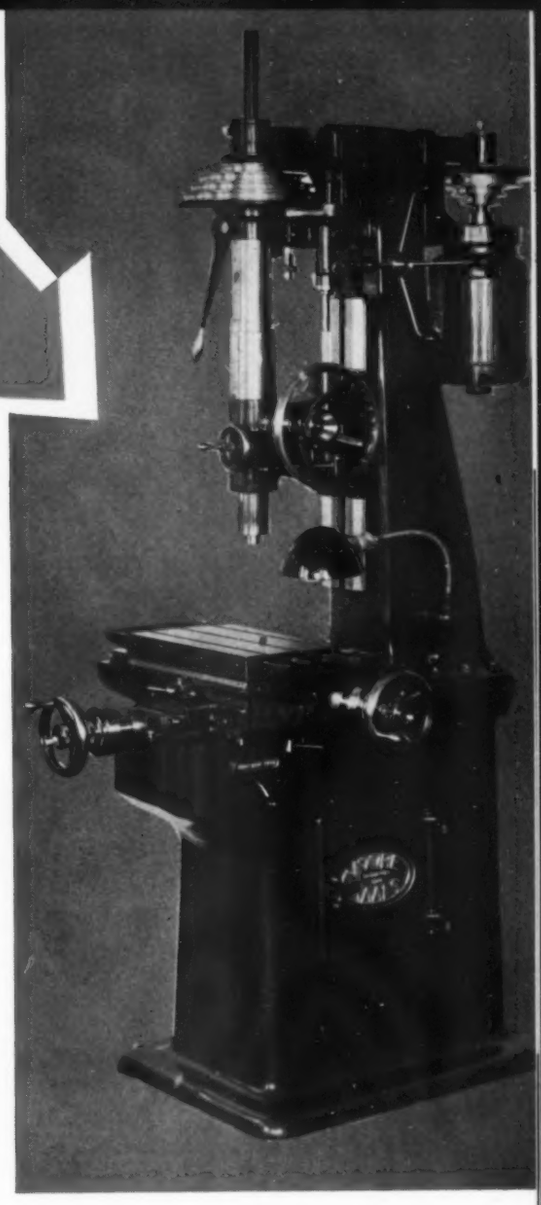
Hardened Steel Ring Gauge—finished to an accuracy of .000025" for roundness and straightness.

Stone Lettering Air Hammer "Sunnen honing does in five minutes what it took 20 minutes to do by lapping."

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

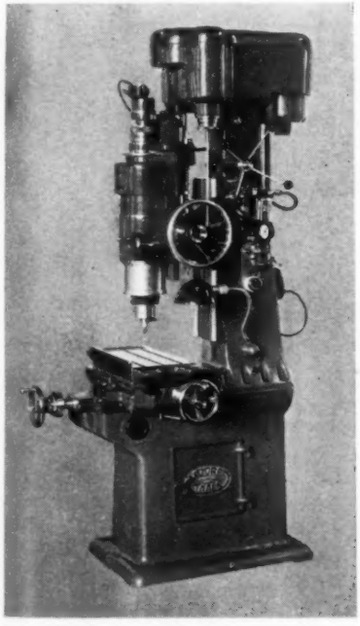
SUNNEN PRODUCTS CO. 7941 Manchester Ave. St. Louis, Mo.
Canadian Factory: Chatham, Ontario

MOORE JIG BORER and MOORE JIG GRINDER



COMPANION MACHINES

that go hand in hand in speeding precision tool and die work . . .



10 SPINDLE SPEEDS AVAILABLE FOR ANY JIG BORING JOB

Fast, accurate spotting, drilling, reaming, boring are handled on the Moore Jig Borer with maximum convenience and minimum effort.

This machine follows advanced and time-tested practice in the use of hardened, ground and lapped parts such as precision lead screws and quill. Spindle is supported on four pre-loaded ball bearings. Utmost accuracy and maintained precision so important to any jig borer are assured in Moore design and construction.

Ten spindle speeds are provided with a range from 100 to 2600 R.P.M. when driven by a two-speed motor. Spindle feed is provided in either direction by power or hand and is engaged with friction clutch.

INFINITE SPINDLE SPEEDS from 50 to 150 R.P.M. PROVIDED by the MOORE JIG GRINDER

This companion machine to the Moore Jig Borer will grind straight or tapered holes to size as well as correct location of holes in hardened steel parts. It has a grinding capacity from .030" to 5". It is indispensable as a means of saving time on die and tool work.

Condensed Specifications

Table Working Surface—10"x16"

Table travel longitudinal—14¼"

Table travel crosswise—9¼"

Table top to spindle end—Min. 3" Max. 16"

Vertical adjustment of quill housing—9"

Boring capacity — (with 2 speed motor) 3½" tool steel; 4" soft steel (with single speed motor) 2" tool steel 2½" soft steel.

Write for* COMPLETE DETAILS *on These Essential Tool Room Machines

Manufactured by

THE MOORE SPECIAL TOOL CO., Inc.

BRIDGEPORT, CONN.

Exclusive Representative

MARBURG BROS., INC., 90 West Street, NEW YORK CITY

MATTISON

HIGH-POWERED PRECISION SURFACE GRINDER

SPEEDS UP PRODUCTION

Cuts Costs

• The Mattison High-Powered Precision Surface Grinder has massive double-column support for the wheel head; smooth, rapid, double-cylinder, hydraulic table drive; large capacity; ruggedness of construction and ample power for rapid stock removal.

Here is a great cost-reducing machine which provides precision grinding results on a high production basis. We will be pleased to furnish you with complete details regarding the advantages of the Mattison Surface Grinder as applied to your work.

MATTISON MACHINE WORKS—ROCKFORD, ILLINOIS

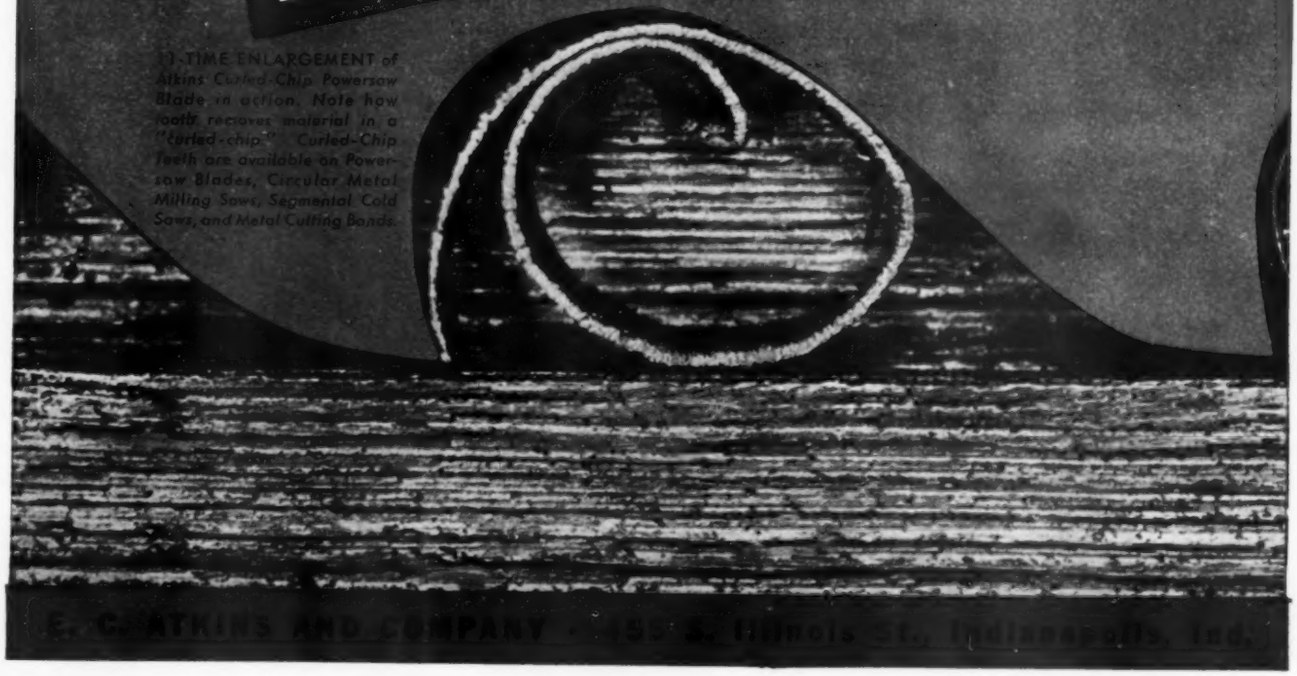
ATKINS *Curled-Chip Teeth*

WITH LATHE TOOL CUTTING QUALITIES

SHOCK TROOPS
In the Battle for Production

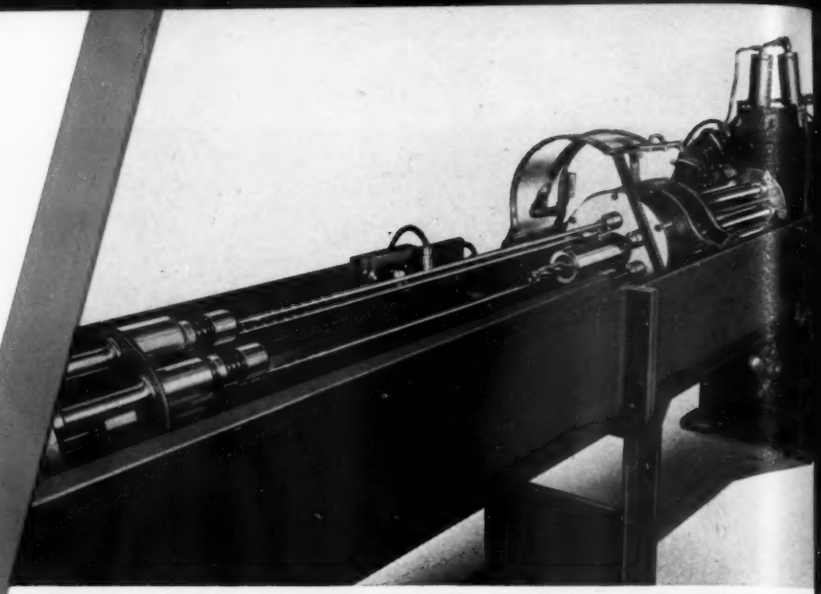
● Thrown into battle on the important metal cutting sector of the industrial battle front, Atkins Curled-Chip Saws go through metal faster, stay in the fight longer with less frequent relief than others heretofore available. All this results primarily from their new tooth design—one that adapts the scientific cutting principle of lathe cutting tools to metal saws—one that removes metal in continuous chips jumping clear like lively clocksprings.

To help industry achieve and maintain peak efficiency on metal cutting work, Atkins offers the experience of over 8 decades of saw engineering to users of metal cutting saws. Call on our engineering department for close co-operation in getting the right saw on every job.



10-TIME ENLARGEMENT of Atkins Curled-Chip Powersaw Blade in action. Note how tooth receives material in a "curled-chip." Curled-Chip Teeth are available on Powersaw Blades, Circular Metal Milling Saws, Segmental Cold Saws, and Metal Cutting Bands.

E. C. ATKINS AND COMPANY · 402 S. Illinois St., Indianapolis, Ind.



GUN RIFLING

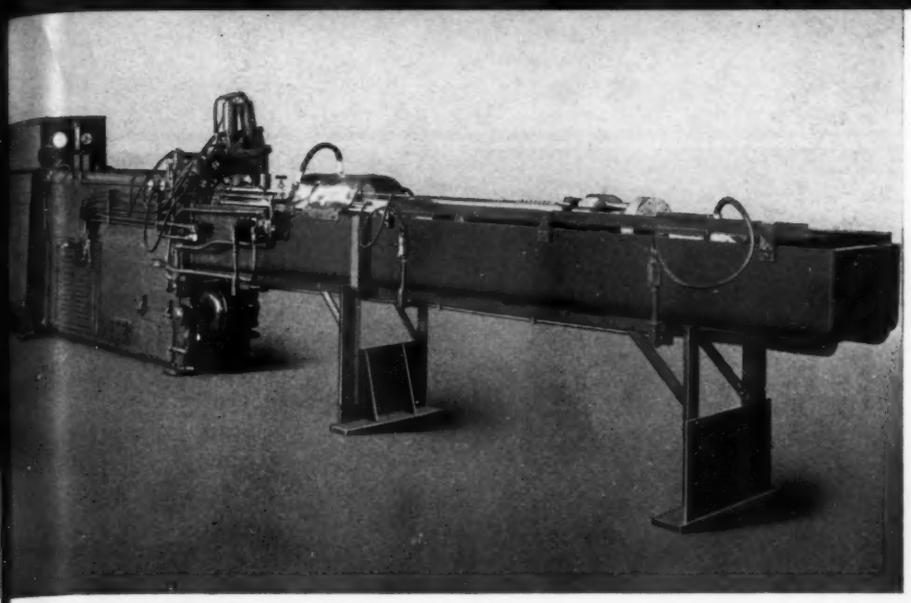
at Production Speeds!

Working in cooperation with leading gun barrel manufacturers and with Army ordnance officers, Lapointe has succeeded in developing HIGH PRODUCTION equipment for rifling .30 calibre, .50 calibre, 20 m.m. and 37 m.m. gun barrels.

The photographs amply illustrate the revolutionary nature of the tooling, fixtures and equipment, incorporating new ideas that make it possible to produce a completely rifled gun barrel at every cycle of the machine. From five to seven broaches are used, depending on the diameter, and by means of the indexing fixture which holds the gun barrels, progressive cuts are taken in all barrels simultaneously. In addition to completing the rifling operation, the final broach of each set simultaneously sizes the bore of the barrel. The easily loaded drum type fixture indexes automatically after each stroke to permit the removal of a completed job and the chucking of a new barrel.

Lapointe—for forty years pioneers in the art of broaching—are constantly engaged in perfecting broaching methods, in developing new applications for broaching, in improving the speed and accuracy of operation. And now Lapointe engineers are applying their skill to the needs of munitions production, helping manufacturers of aircraft and armaments to attain higher efficiency, greater accuracy and much-needed faster production.

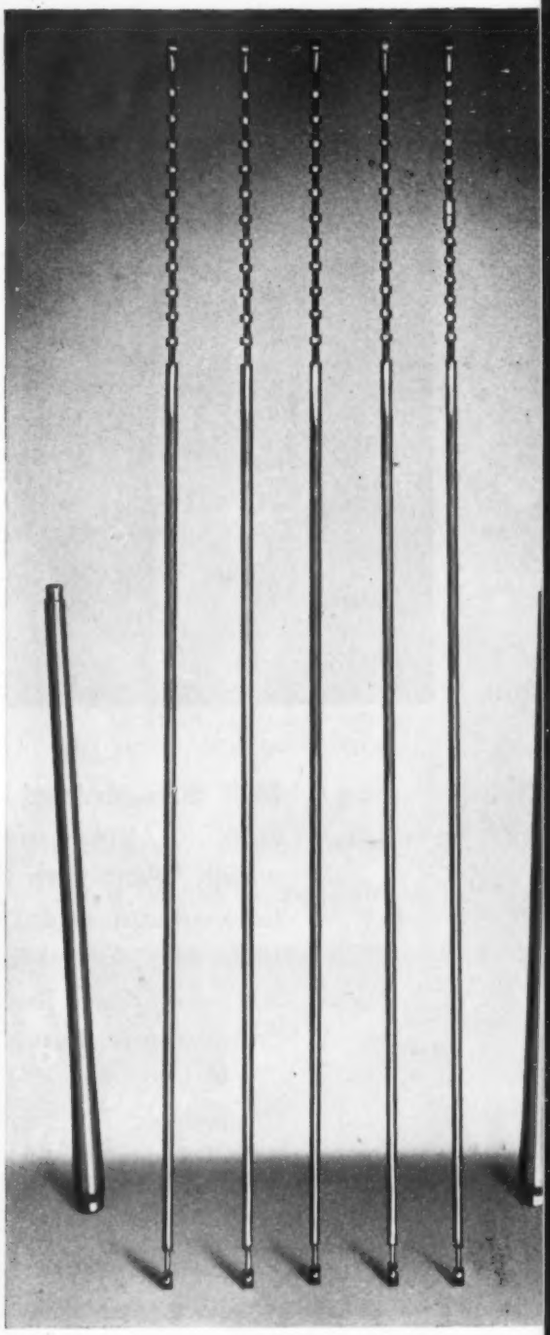
LAPO

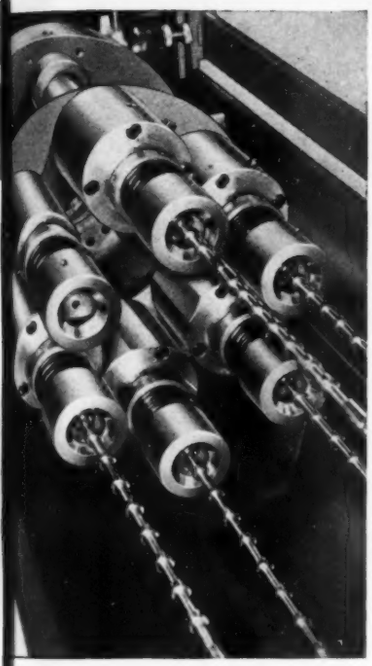


Far left: The rear carriage carrying the five broaches advances to allow their shanks to engage a quintuple puller which completes the operation by pulling the broaches through the machine gun barrels which can be seen in the drum fixture.

Left: Overall view of the Lapointe Broaching Machine equipped for rifling machine-gun barrels, showing hydraulic system and indexing mechanism.

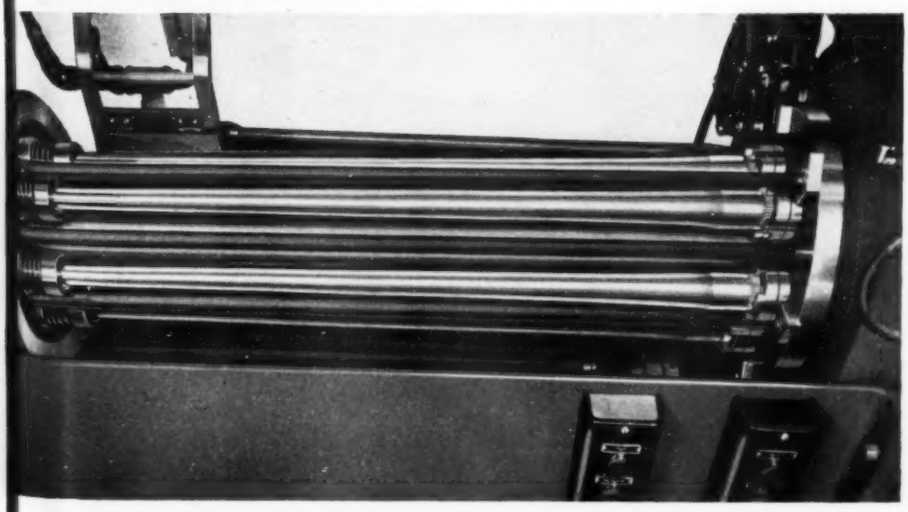
Below: The set of five broaches which are used to rifle the machine-gun barrels of the type shown.





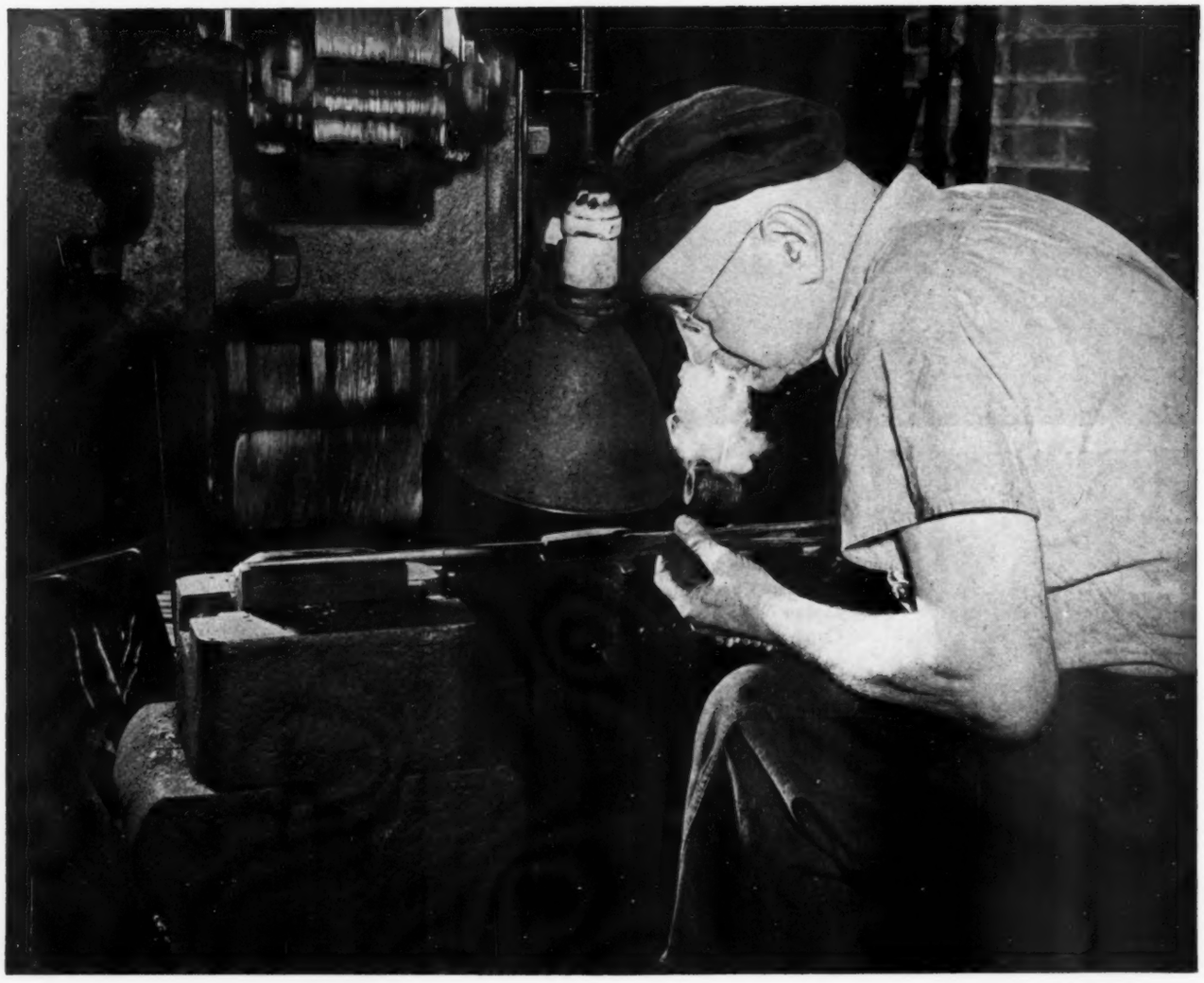
Close-up of the rear carriage showing the five broaches. The holes in which the broaches are inserted are sealed completely, allowing the cutting oil to be fed under pressure to the broaches only when the rear carriage engages the front fixture. (See photo above left.)

Below: The rotating, six-station fixture. Five stations are for the broaching operation and the sixth for loading and unloading. Indexing mechanism is shown at upper right.



INTE

MACHINE TOOL COMPANY
HUDSON, MASS.



Skill through long specialized experience, and pride of workmanship . . . these are the qualities that characterize the manner in which "American Swiss" Swiss-Pattern Files are made. This old time artisan, intent on his job of forging blanks for these precision tools, is typical of the many veteran mechanics who have been making "American Swiss" Files for a quarter century and more. You can be sure that each of the 3,000 different types and sizes of "American Swiss" Files is flawless in workmanship as well as uniformly excellent in every other respect.

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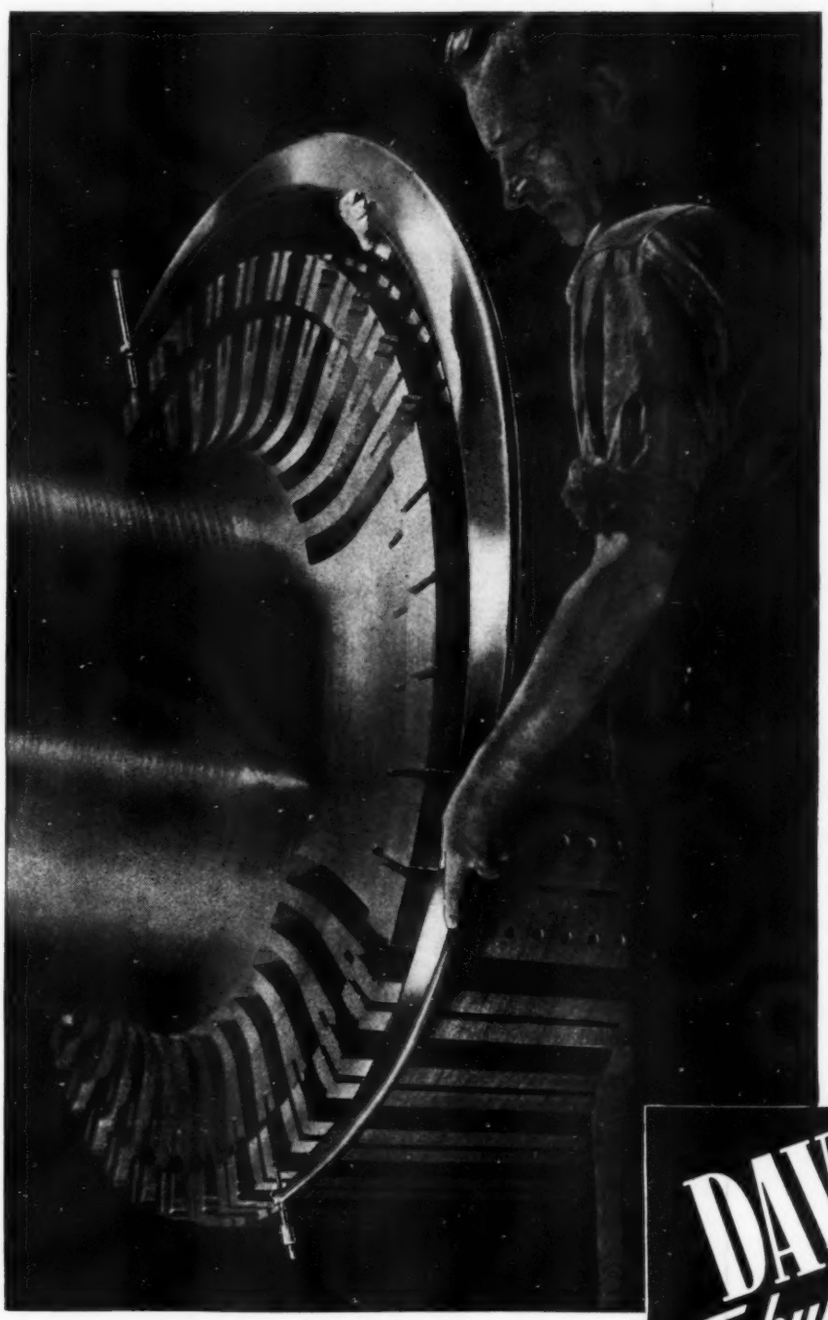

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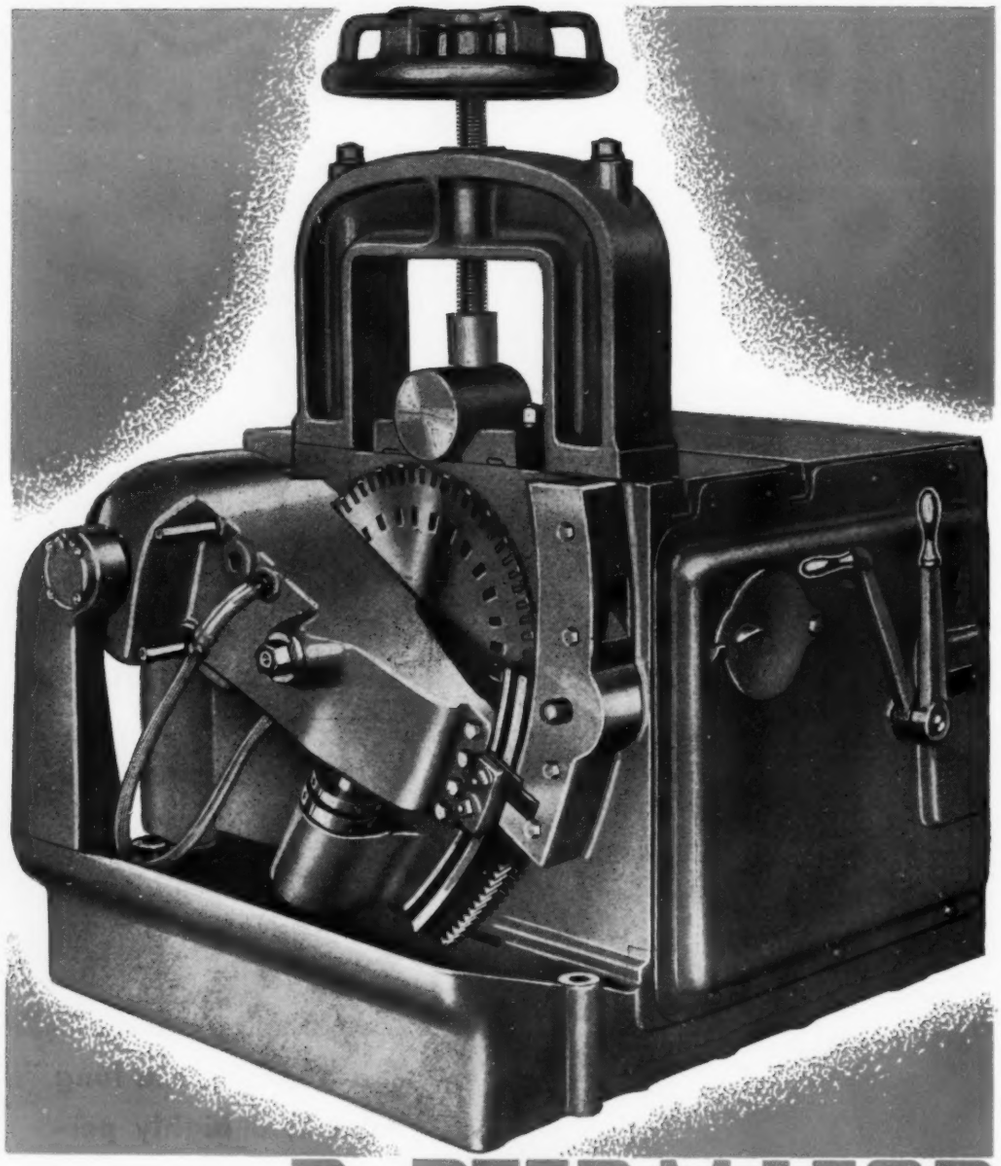

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. . . speeds production through faster, cleaner, straighter cuts

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Unique features of design and operation make possible the high speed and accuracy of this Porter-McLeod sawing machine. Blade is pulled upward through the stock and supported front and back close up to its rim—a construction which prevents buckling and weaving. Feed is by friction disc, a feature which adapts the machine to practically any cutting requirements and provides insurance against blade breakage in the event hard spots are encountered in the stock being cut.

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Investigate the time and cost-cutting possibilities offered by the PORTER-McLEOD on your cold metal sawing.

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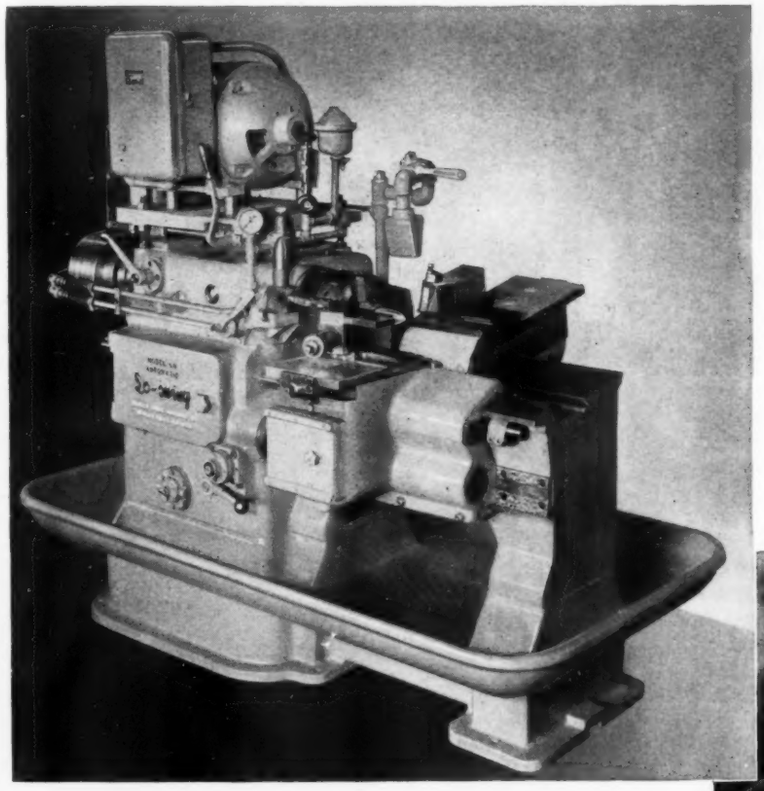
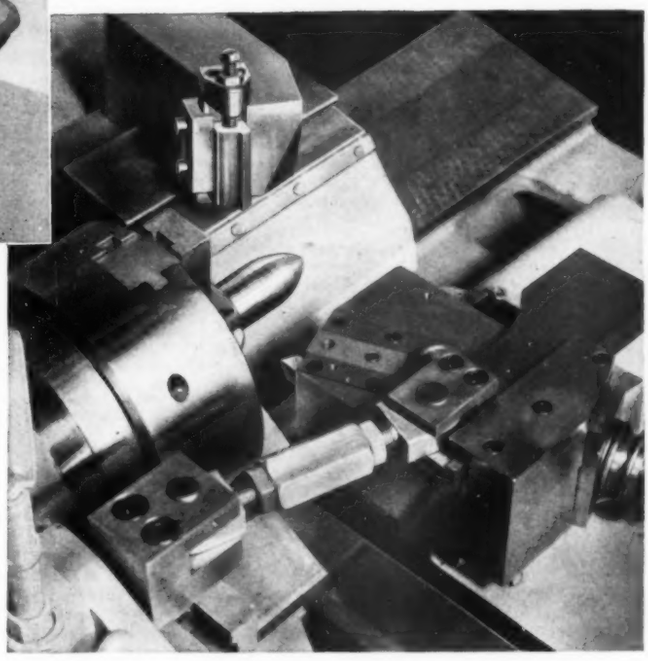
MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



Model "LR" *Lo-Swing*

SPEEDS UP AUTOMATIC PRODUCTION OF 37 MM ARMOR-PIERCING SHELLS



PROBLEM: To automatically turn points and front bourrelet of 37mm. A. P. shells from rough forgings.

SOLUTION: The Model "LR" Lo-swing was selected for this job because of its sturdy, compact design and ease of operation by unskilled machine operators.

The work comes to the machine as a rough forging having approximately 3/32" material to be removed from the diameter. It is held and driven with a three-jaw, air-operated chuck after being located in a definite position in the chuck in relation to the base of the shell so as to assure ample surplus material for facing the base in a subsequent operation. The close-up illustration shows the template-operated tool block, mounted on the front carriage slide, which turns the body and point of the shell over a length of 3". This front tool feeds towards the tailstock end of the machine and finish turns the point down to a diameter of approximately 3/8". The extreme point is then finished with a form tool mounted on the rear slide which enters the cut after the front tool has ceased cutting, thus avoiding any tool marks which might otherwise be caused by a sudden pressure from the rear tool.

A Carbide tool is used in the template-operated front tool block while the rear forming tool is made of Stellite. A production of 82 pieces per hour can be easily maintained.

The Model "LR" Lo-swing Lathe is completely automatic and can be operated satisfactorily by an unskilled operator, who merely loads and unloads the shells and operates the starting lever.

LATHE NEWS from SENECA FALLS

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means more jobs for

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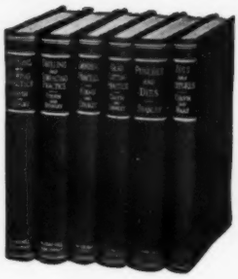
—and MORE PAY for men who know their work



This home-study course gives you the practical facts on modern machines, up-to-date methods, you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency with

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—practical information on grinding machines and abrasive wheels, showing what they do, how to operate them, and how to make best use of them on various types of work.

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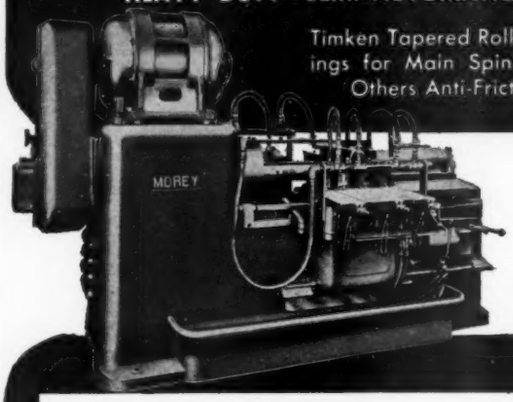
Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction.



Semi-Automatic: A complete feeding and return cycle. A single movement of the starting lever starts the spindle revolving and the tools feeding. When work is completed, tool is returned to loading position, spindle is stopped and the work unclamped ready for removal.

Rigid enough to use carbide tools to their full capacity.

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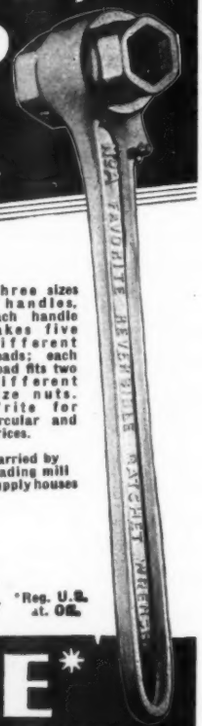

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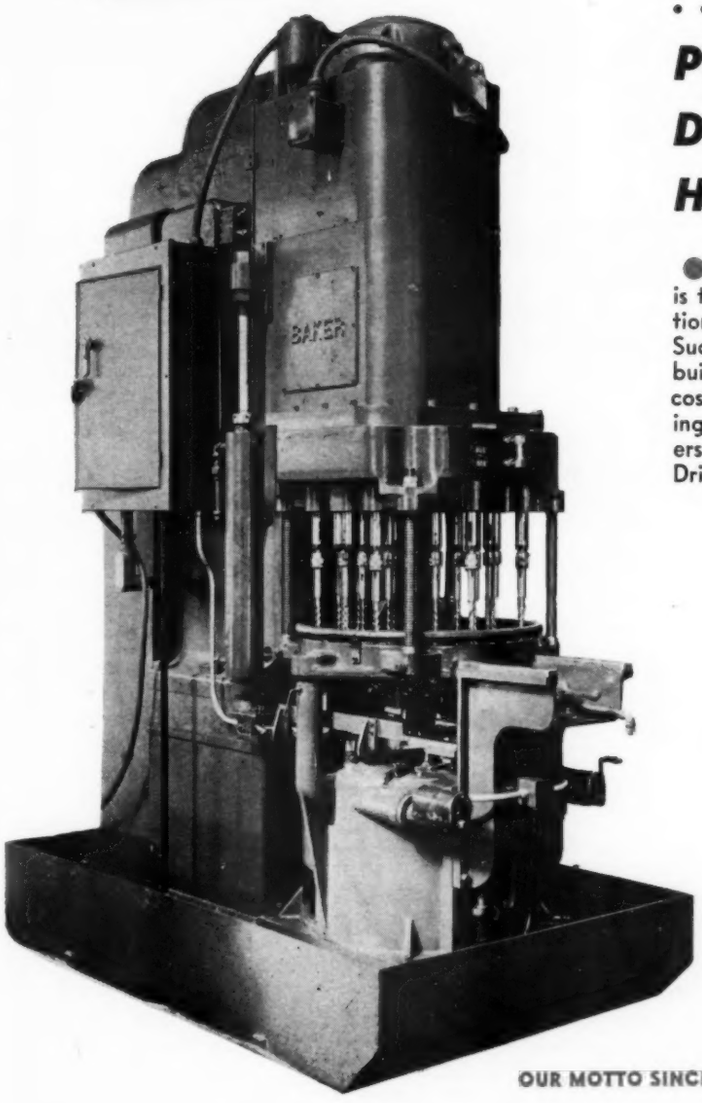

OUR MOTTO SINCE 1867

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OPERATION . . . These machines multiple drill 19 thru holes, 13 of .3125" diameter, and 6 of .5625" diameter.

PART . . . A magnesium casting of a supercharger housing front.

TOOLING . . . Fixed center multiple head with 19 spindles and special fixtures. Spindles equipped with floating tool holders which carry taper shank drills to proper grind and length.

METHOD . . . All holes are drilled thru the piece, depth being roughly 5¾". To hold drill run to a minimum, piece is drilled from both ends of holes. Operator chucks part, front surface up, and drills holes to one-half depth—then turns part over in same fixture and drills holes thru. Fixture is designed so that part can readily be rechucked. Unit makes two cycles to complete piece.

Here, then, is a unit tooled for a special job during the emergency . . . *but it's equally adaptable for cost-reducing operations under normal conditions.* For efficient operations on special jobs *now*, and the assurance of future usefulness, select BAKER machines.

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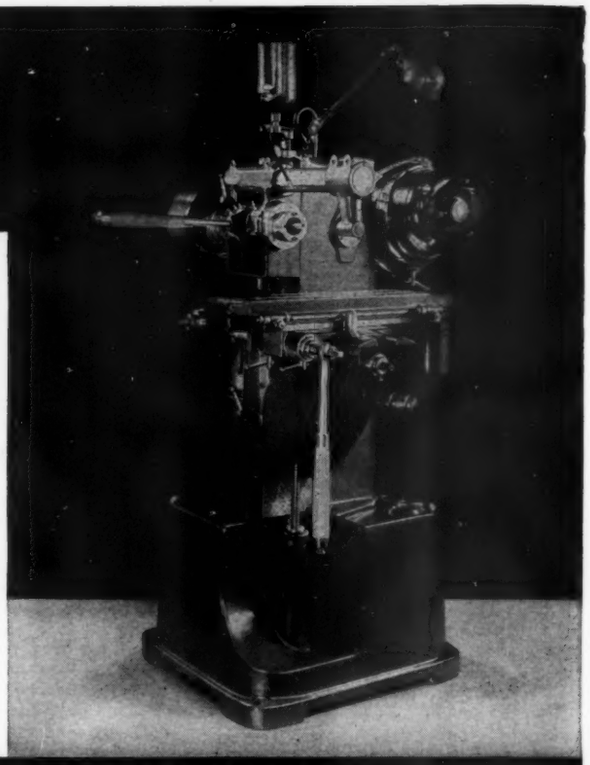
NICHOLS HAND MILLING MACHINE



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. . . heavy box section. Knee with extra long dovetail slides for both vertical adjustment and horizontal traverse

. . . table, fitted with oil pockets at ether end can be operated from either side of machine and locked in any position; standard equipment includes micrometer table stops; table feed screw optional.

. . . hand operated vertical head fitted with hand set depth stop; can be locked in any position.

. . . spindle hardened and ground mounted on Timken Precision Roller Bearings

. . . capacity: longitudinal feed 10"; traverse feed 7".

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KENNAMETAL TOOLS DO 8 HOURS' WORK IN 90 MINUTES

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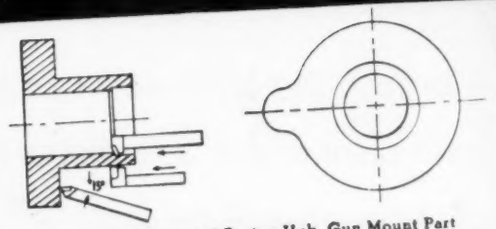

Operation: Facing and Boring Hub, Gun Mount Part
Material: Rough Steel Casting, 8" dia. with protruding lug
Speed: 250 S.F.M. Feed: .012

The tool set-up above shows how KENNAMETAL tools are giving one manufacturer an 80% time saving in machining parts for gun mounts. Previously, the facing operation was accomplished by use of a special alloy high speed tool bit protruding 3", doing the interrupted facing cut.

STYLE NO. 21

In the KENNAMETAL set-up the compound rest was swung 90° for rigidity and a standard 20T150 KENNAMETAL planer tool, held as shown to cut to a square shoulder, was used for facing. Previously, the tools had always headed into the cut and the carriage had to be backed off, but KENNAMETAL TOOLS did the work so smoothly that only one cut was required, instead of two. Roughness of casting and interrupted cut made the negative rake angles of the style 20 tool preferable to the standard facing tool style 12. A KENNAMETAL 21T150 tool with a 2½" overhang was used for boring, and a KENNAMETAL 9T80 tool turned the outside diameter. This set-up, and the KENNAMETAL tools employed, permitted completion of each job in 90 minutes, *a saving of 6½ hours per job.*

STYLE NO. 20

STYLE NO. 9

KENNAMETAL is proving itself by similar performance in armament plants throughout the country . . . machining steel of all hardnesses up to 550 Brinell at economical high speeds, with minimum tool wear and longer life between regrinds. Write for free copy of the new vest pocket manual for KENNAMETAL users.

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How to control production in a modern factory

Do you know how other plants like your own control their procurement and storage of materials? their routing of operations and processes? their dispatching? Do you know how they are controlling quality? Do you know what production records they keep and how they report on operations? Here is a book written out of actual industrial practice today that tells you specifically and in detail.

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By Lawrence L. Bethel, Director, New Haven YMCA Junior College; Walter L. Tann, Farrel-Birmingham Co.; Franklin S. Atwater, Production Engineer, Fafnir Bearing Co.; and Edward E. Rung, Production Control Manager, U. S. Rubber Co. 275 pages, 6 x 9, illustrated. $2.75.

This book grew out of a survey of current factory methods in 185 representative companies in all types of industry. It takes up the problems of poduction planning and control as they occur in actual practice today, beginning with forecasting of sales and production volume, going on to the planning and budgeting stage, then to such factors as routing, scheduling, dispatching, inspection, etc., and finally to such control factors as control of inventories, costs, methods of classifications, identification. Every chapter in the book will give you valuable suggestions and ideas for improving your control methods.

Look up in this book:

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—the explanation of the three types of budgets
—the treatment of the cycle of production planning
—the examples of purchasing and stores records
—the routing charts
—the example of a master control schedule
—the discussion of planning boards
—the study of when, where and how much to inspect

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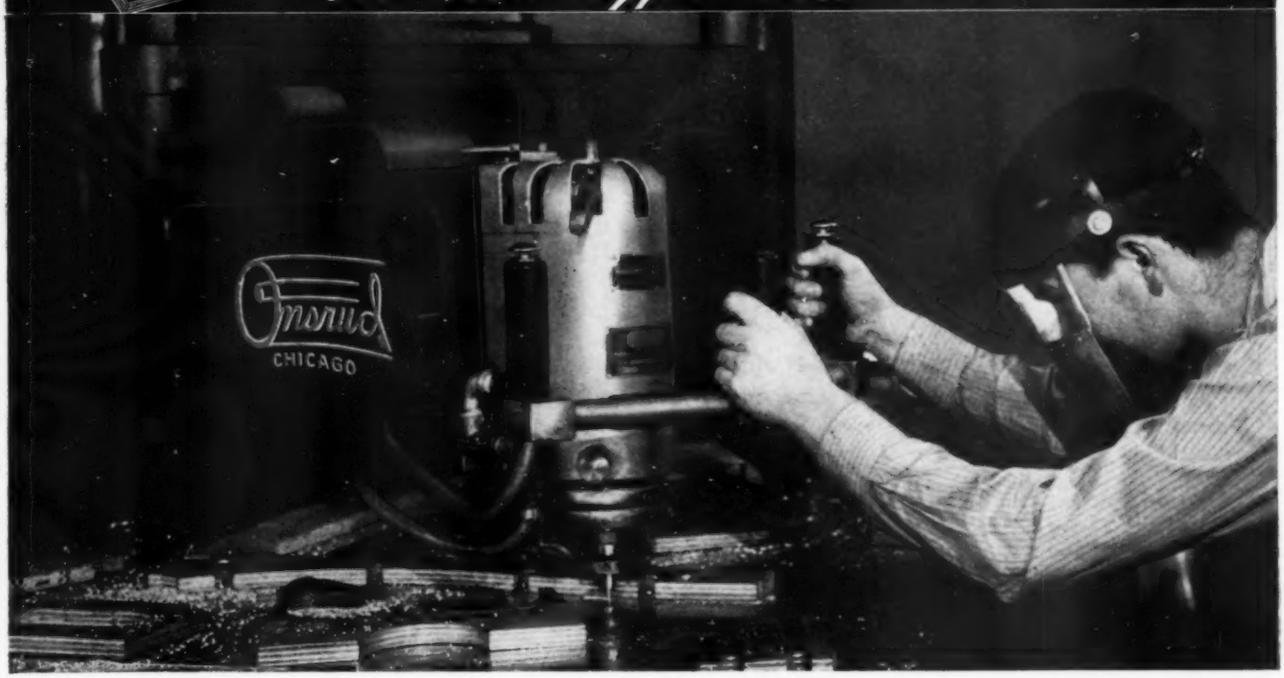
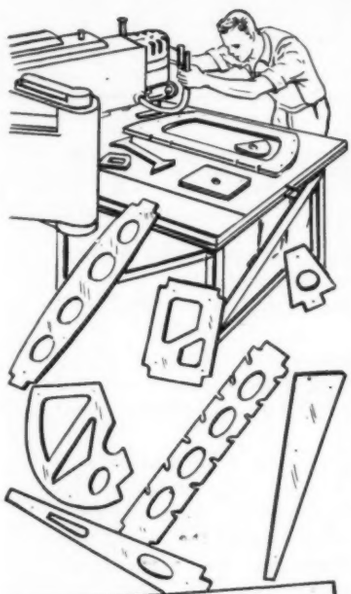
For your note book on new type machine tools





from bench shears and hand snips to a STACKED-SHEET-CUTTING ONSRUD RADIAL ARM ROUTER

Today stacked flat sheets up to 5/8" total thickness, as large as 4' wide x 12' long, are placed on a table . . . and in one set-up, hundreds of parts are cut to shape, so accurately and smoothly that further machining is unnecessary. Patterns guide the cutter, so that accuracy within .031" is easy to hold. In a typical set-up, 25 parts of .025" Alclad are cut at the same time at a feed of ten feet per minute.

Turning at 15,000 RPM, the router bit makes a finish smooth cut in all machinable nonferrous metals and alloys, plastics, wood, and composition. Used primarily in cutting stacked flat sheets, the Onsrud Radial Arm Router is also used for cutting formed and extruded parts whose over-all thickness is within the limits of the machine.

Like all other Onsrud high speed machine tools, the radial arm router incorporates many exclusive features, vital to constant high RPM performance. Metered Mist, for example, is the Onsrud patent mechanical lubrication system for the perfect feed of oil to spindle bearings turning from 5,400 RPM to 75,000 RPM.

In the U. S. aircraft industry alone, 99% of the plants are using Onsrud machine tools; millions of machine hours of operation prove the outstanding abilities of Onsrud new type, high speed equipment.

Whether you're building the products of war that are needed today or planning for production once the victory is won, make a note of the Onsrud Radial Arm Router, a new type machine tool, and the job it can do.

NOTE

Send for the new Onsrud manual, "Tricks and Tips on High Speed Drilling and Routing." Please write on your company letterhead.

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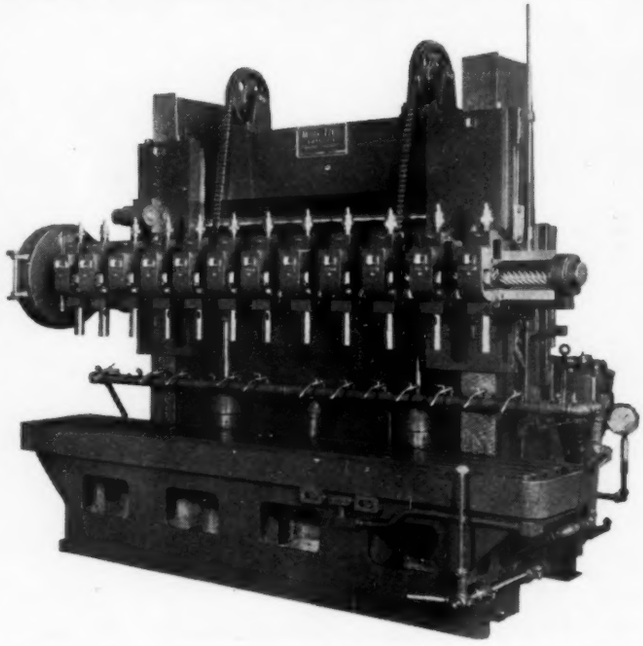
AIR TURBINE and HIGH CYCLE TOOLS and MACHINES
ROUTING · DRILLING · SHAPING · GRINDING · MILLING

What Causes Increased Production?

● The fastest machine in the line does not determine the production rate—but, if faster machines are not placed in the production line, the rate never can rise.

Replacement of the slowest machine with one which performs more rapidly will permit the whole line to produce faster.

The HF64 hydraulic, rail feed, straight line drilling machine is one of many machines designed by Moline Tool Company to help in boosting production rates. This machine will drive sixteen ¾-inch drills, or thirty-two ⅝-inch drills in low carbon steel, or an equivalent load in other materials.



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MOLINE TOOL COMPANY

MOLINE, ILLINOIS — *Cable Address: "Holehog" Moline* — ESTABLISHED 1901

THE "HARTFORD" QUICK ACTING MILLING VISE

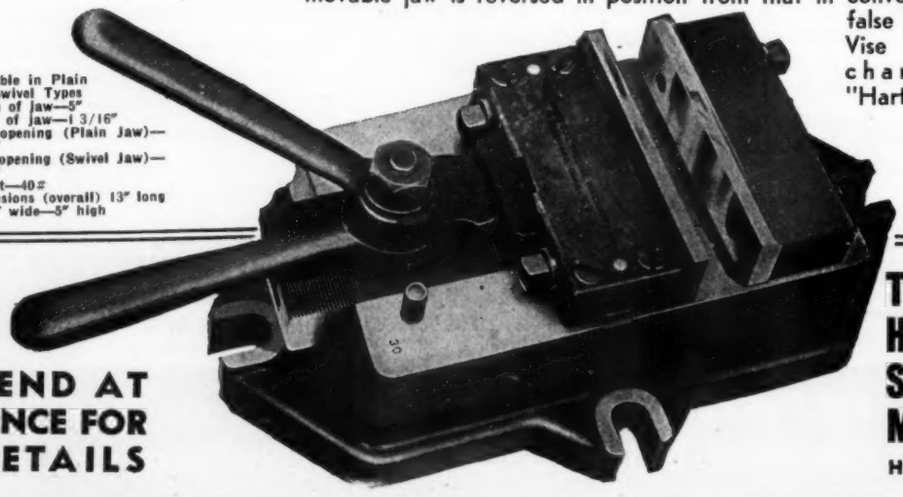
...specially developed for speeding up production milling of small arms

The "Hartford" Quick Acting Milling Vise holds work securely under highest speed and feeds. It assures faster work and greater holding power. Its convenient operation and tremendous binding power are provided by two levers which are easily manipulated by one hand.

The lower, cam-faced lever provides quick opening and return; the upper eccentric lever exerts the pressure for holding work. Chip clearance or work removal can be handled by release of binding lever and a quarter turn of eccentric lever which opens jaw about ⅞".

Practically indestructible, the "Hartford" assures positive jaw alignment regardless of how work is held. Jaw is a one-piece, heat-treated drop forging. The movable jaw is reversed in position from that in conventional vises. Existing false jaws of the No. 2 B&S Vise can be used interchangeably on the "Hartford."

Available in Plain and Swivel Types
Width of jaw—5"
Depth of jaw—1 3/16"
Max. opening (Plain Jaw)—2⅝"
Max. opening (Swivel Jaw)—2¼"
Weight—40#
Dimensions (overall) 13" long —8" wide—5" high



SEND AT ONCE FOR DETAILS

THE HARTFORD SPECIAL MACHINERY CO.

HARTFORD, CONN.

STERLING SPEEDY PRODUCTION SUGGESTION

CHANGE WHEELS When You Change GRINDING JOBS

THE kind of grinding job you are doing determines the bond, grain, structure, size and shape of your wheel. Using one wheel on several jobs often means slow production . . poor work! The wheel is not being used on the work for which it was constructed . . . it becomes a time-waster . . . slows up your victory effort!

During the emergency, there are Sterling Grinding Wheels that can be used on more than one job, but the advice of a Sterling engineer should be sought before attempting to use them. In most cases, however, you will find that the use of a special wheel only on the job for which it was designed will not only help you turn out better work faster, but will also make your wheel last longer.

If your wheels do not seem to be giving good service, it may be they are not being used on the right job. Consultation with a Sterling engineer will quickly solve your problem . . help you speed production for speedy victory! Ask for this free service today.

•

Defense Bonds and Stamps are our country's bulwark against agression. Buy as many of them as you can—today! Be participants in victory!

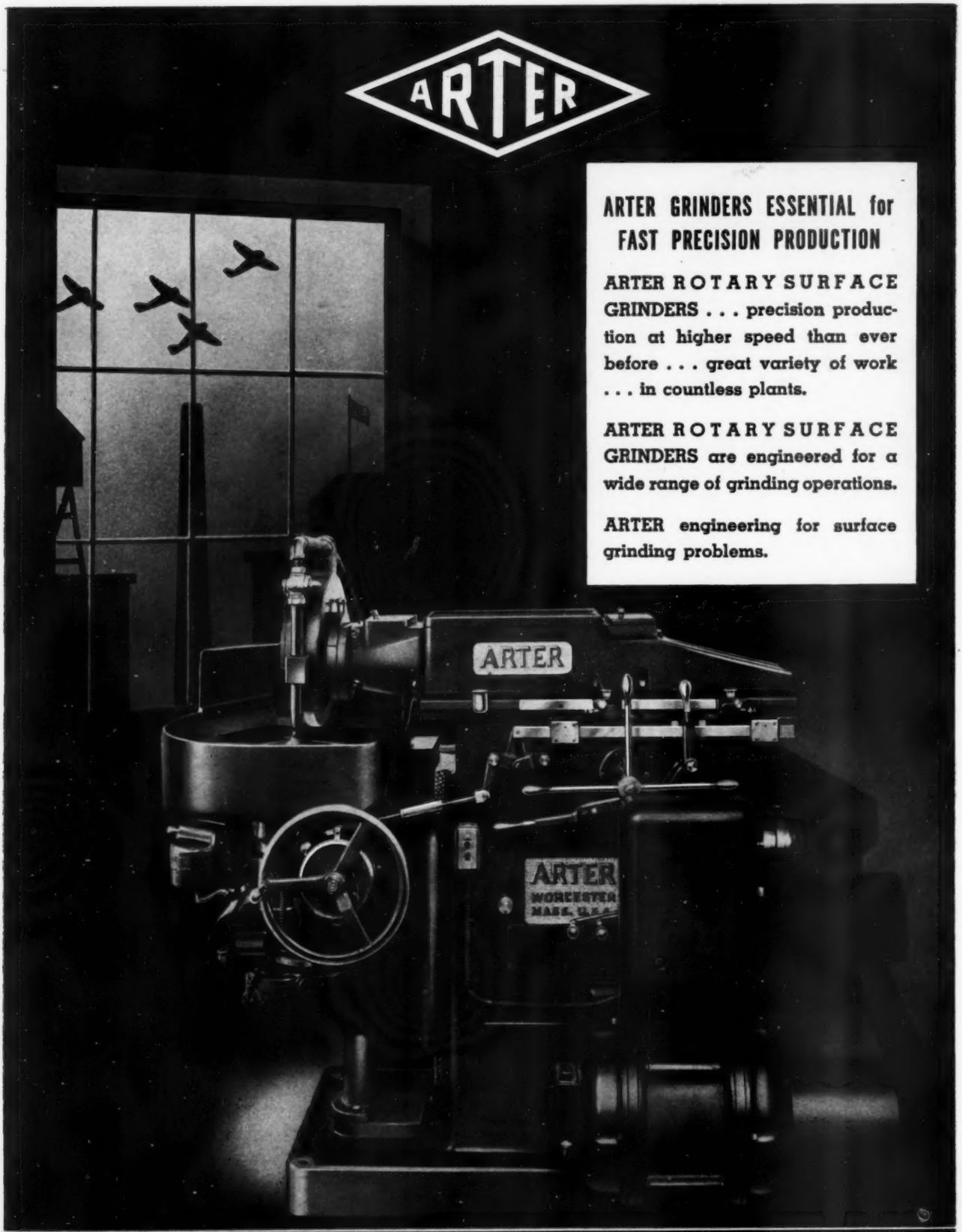
Have you Sterling Catalog No. 40A? It lists the various types of Sterling Grinding Wheels that are available to solve your grinding problems. Ask for it on your letterhead, and it will be mailed at once.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

ARTER



ARTER GRINDERS ESSENTIAL for FAST PRECISION PRODUCTION

ARTER ROTARY SURFACE GRINDERS . . . precision production at higher speed than ever before . . . great variety of work . . . in countless plants.

ARTER ROTARY SURFACE GRINDERS are engineered for a wide range of grinding operations.

ARTER engineering for surface grinding problems.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

MACKLIN
GRINDING WHEELS

Macklin Wheels Are Uniform

Uniform grinding wheels, after most rigid control of previous operations must be carefully and skillfully finished to exact micrometer limits on the face, sides and arbor hole. Special new and modern lathes operated by experienced craftsmen insure uniformity of size in each and every high quality MACKLIN grinding wheel. Protect Your Production with grinding wheels that are always uniform.

Ask for Macklin Engineering Service.

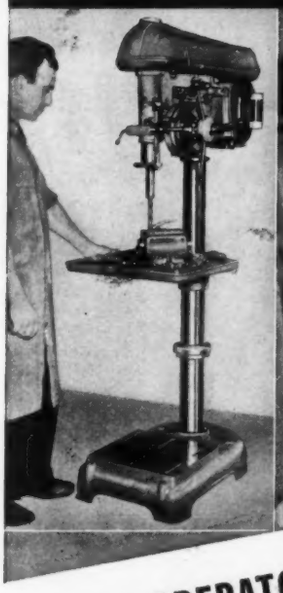
MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

SHORT ON SKILLED HELP?

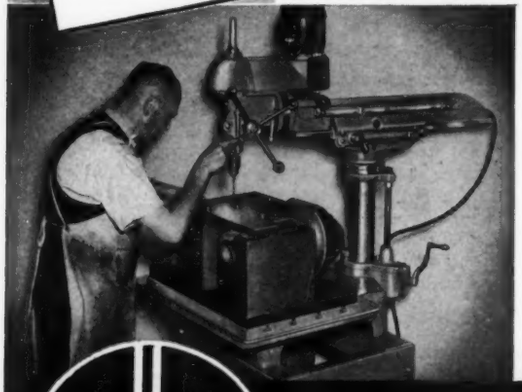


WOMEN OPERATORS and UNSKILLED WORKERS

can easily handle many production jobs . . . on

WALKER-TURNER DRILL PRESSES

because



THEY'RE SAFE: All possible safety devices are incorporated in all W-T Machine Tools. Belts and pulleys are amply covered with approved type guards.

THEY'RE SIMPLE: Easy to set-up and operate. No complication of levers and dials to confuse the novice. They have adjustable heads and tables and positive depth gauges.

THEY'RE DURABLE: Built for 24-hour operation. Production-tested, they *stand up* under the unintentional abuse of inexperienced operators. Four SKF ball bearings insure quiet operation and long life.

THEY'RE EASY TO OPERATE: Careful design and engineering and the absence of unnecesary gadgets reduce dead weight on the spindle to a minimum. This greatly reduces operator fatigue, especially on long runs or continuous operation.

THEY'RE REASONABLE IN PRICE: Remarkably low . . . . and deliveries can be made with reasonable promptness to industries engaged in defense activities.

For further information write

WALKER-TURNER CO., INC. 4532 Berckman St., Plainfield, N. J.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

WALKER-TURNER MACHINE TOOLS

FOR METAL, WOOD AND PLASTICS

DRILL PRESSES · BAND SAWS · BENCH SAWS · TILTING ARBOR SAWS · LATHES
JIG SAWS · RADIAL SAWS · RADIAL DRILLS · BELT AND DISC SURFACERS · JOINTERS
SPINDLE SHAPERS · GRINDERS · FLEXIBLE SHAFT MACHINES · CUSTOM BUILT MOTORS

Are You Prepared To Meet TOOL SACRIFICES?

Production **must** go on—in spite of shortages in high speed tools! To keep all your tools cutting with maximum efficiency, to get longer service from every tap, drill and cutter, enlist the aid of Oliver Tool Conditioners. Oliver methods of tool conditioning eliminate all the major causes of tool breakage, work spoilage and inaccuracies by reproducing exactly the original contours of every type of tool. And Oliver automatic action does the job faster and far more accurately than any hand-controlled method. Oliver-conditioned tools last longer and permit the use of increased feeds and speeds, because they cut evenly and accurately, with every point and tooth doing its full share of the work.

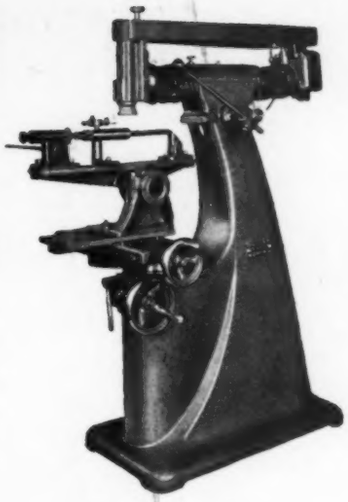
American manufacturers are fighting a war against waste, too. Use Oliver Tool Conditioners for your major weapon in conquering waste of cutting tools.

OLIVER OF ADRIAN PRODUCTS

OLIVER INSTRUMENT CO.
1414 E. MAUMEE STREET
ADRIAN, MICHIGAN

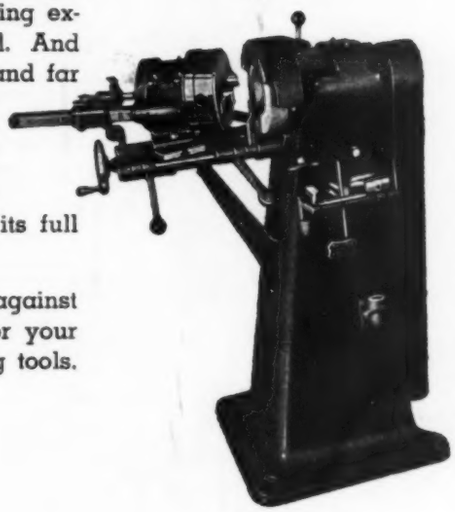
Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN



OLIVER UNIVERSAL TOOL AND CUTTER GRINDER

With a few simple fixtures, grinds face mills, slitting saws, end mills, angular cutters, slab mills, spot facers, formed cutters, gear cutters, reamers, etc. Produces accurate clearances by direct reading — uniform teeth, correct angles and accurate cutting edges that give longer tool service. Work is held stationary and grinding wheel traverses tooth, adding to ease and accuracy of operation.



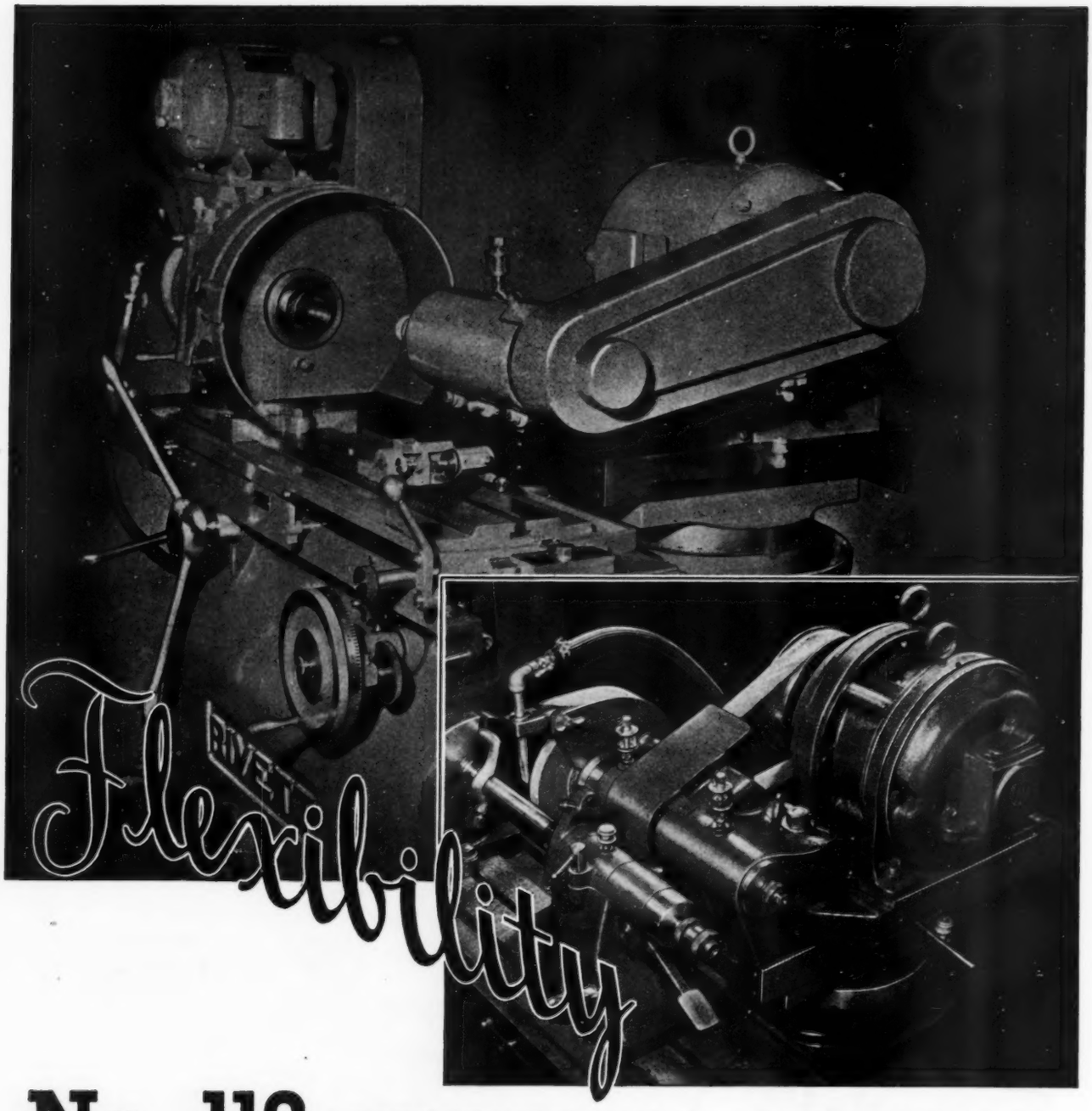
OLIVER No. 510 DRILLPOINTER

For all drills from ½ to 3 inches in diameter—all angles from 82 to 160 degrees. Automatically produces the ideal hollow-ground point with variable clearance that means free cutting in any metal or plastic. Reduces drill cost by getting a greater number of accurate holes from every drill. Reduces production costs by making possible increased feeds and speeds.

OLIVER No. 2 ARC FACE MILL GRINDER

For all face mills from 6 to 26 inches in diameter. Eliminates sharp corners, producing edges perfectly ground to any radius. Oliver-conditioned Face Mills give smoother operation and cut longer between grinds. Used by leading manufacturers in automotive and other high-production industries.

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS — DRILL POINT THINNERS —TEMPLATE TOOL GRINDERS — FACE MILL GRINDERS, DIEMAKING MACHINES



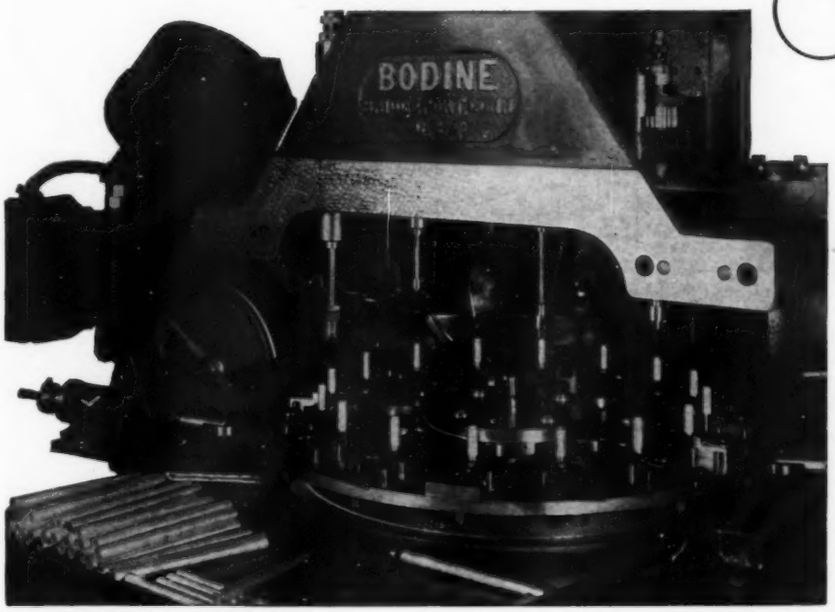
No. 112 UNIVERSAL GRINDER

Primarily is for medium and large internal and external tool-room grinding, straight, bevel, two angle or straight and bevel at one setting. Wide range of adjustments makes it effective on a great variety of work while its extreme simplicity of design enables any mechanic to operate it. Complete specifications sent on request.

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

Bodine

MAKES ONE JOB OUT OF MANY OPERATIONS..



HIGH SPEED

AUTOMATIC DIAL FEED

CLOSE TOLERANCES

FULLY ADJUSTABLE BALL BEARING SPINDLES

MULTI-PURPOSE • AUTOMATIC

DRILLING • MILLING • TAPPING and SCREW INSERTING

A basic principle, lending itself to great flexibility, is illustrated above in one particular adaptation of the Bodine 48-30 Automatic Dial Type, Drilling, Tapping, Screw Inserting Machine, which in addition to these operations, can also include Milling.

The brass tubing parts, in a variety of lengths of the same diameter are inserted in the clamping fixtures on the dial as it indexes, left to right. At each station both ends of the tube are reamed and counterbored, both ends tapped. Then a hopper fed plug is inserted in one end and automatically driven into position. At next station a spinning tool spins over the metal to seal the plug, after which fixtures automatically unclamp for removal of finished parts.

All operations are performed simultaneously, one completed piece being produced at each stroke of the machine.

(Safety guards removed for full view.)

Bodine does this..

★ Builds adaptations of the Automatic Dial Type Machine for the solution of specific production problems where speed and closely held tolerances are essential . . . and where a multiplicity of operations may be performed in sequence. Six sizes to handle many sizes of parts.

★ Bodine machines are now hi-speeding for ordnance in famous plants of the U. S. and Canada.

THE Bodine CORPORATION

BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

FOR PROMPTER DELIVERIES

Specify Standard Reamers

BEFORE you specify special reamers for that defense job you have to tool in a hurry, investigate standard McCrosky-SUPER Adjustable Reamers. They are made in a variety of styles and a wide range of sizes. They are being produced continuously, and the size you need is on its way to completion before you order . . . McCrosky Reamer Bulletin 15-A will help you decide. Ask for a copy.

McCROSKY TOOL CORPORATION

MEADVILLE — PENNSYLVANIA

COST CUTTING TOOLS

SUPER ADJUSTABLE REAMERS — ADJUSTABLE BLOCK BORING BARS
JACK-LOCK MILLING CUTTERS — SPECIAL PURPOSE TOOLS
WIZARD QUICK-CHANGE CHUCKS — McCROSKY TURRET TOOL POSTS

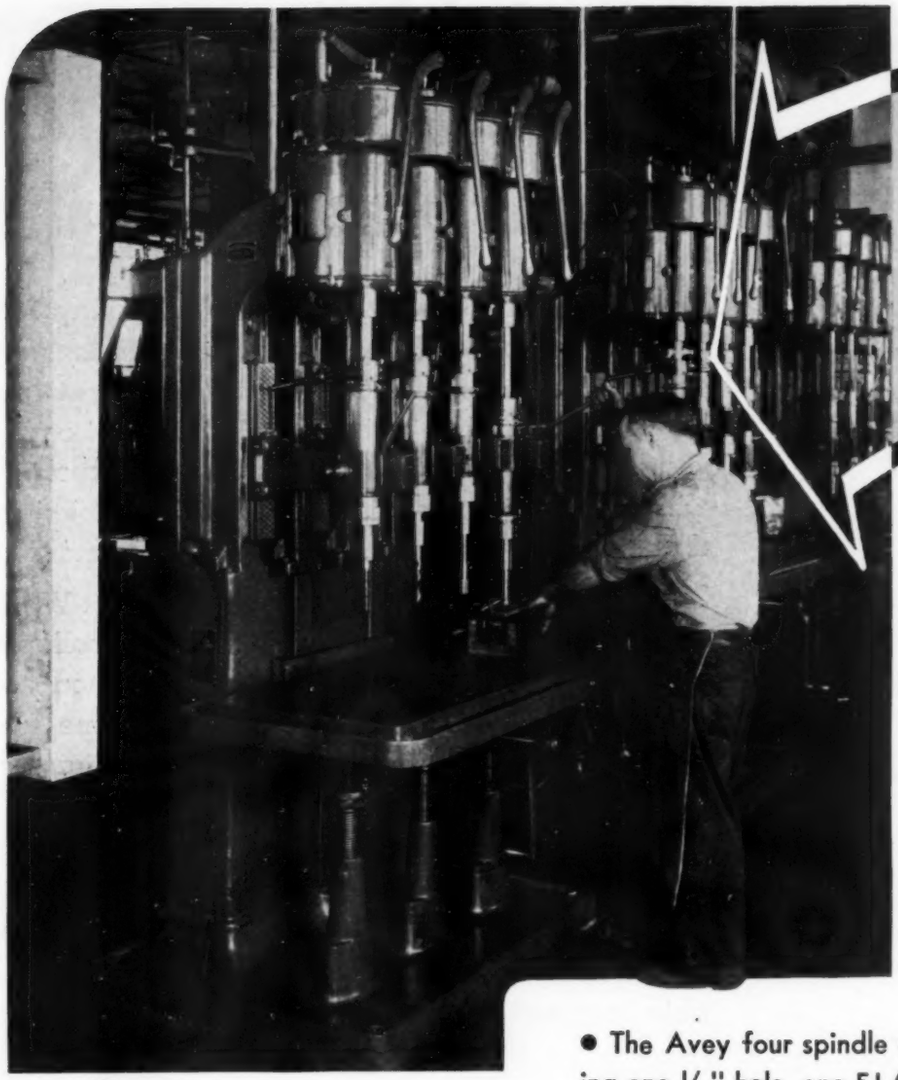
WOODY SPENCER SAYS:
"The Right Blow at the Right Time Won a Heavy Weight Crown."

At Madison Square Garden—June, 1934, in the first round between Max Baer, the challenger and Primo Carnera, the champion—Carnera whipped three sharp lefts to Baer's mouth. Baer replied with a right that sent Carnera to the canvass. Although the fight continued to the 11th before Carnera murmured, "Fini", it is said he never fully recovered from this first paralyzing smash. For Baer—the right blow at the right time won a championship.

Strike a blow at low production. Make sure you are using the right tap for each tapping operation. The right tap at the right time means the difference between expensive, mediocre production and all out production at lower cost. To help select the right taps for your jobs, Wood & Spencer engineers are ready to serve manufacturers without obligation. Simply write us outlining your problem.

"The Right Tap at the Right Time"

The WOOD & SPENCER Co.
Cleveland, Ohio



AVEY keeps small parts moving

for urgent WAR Production

●

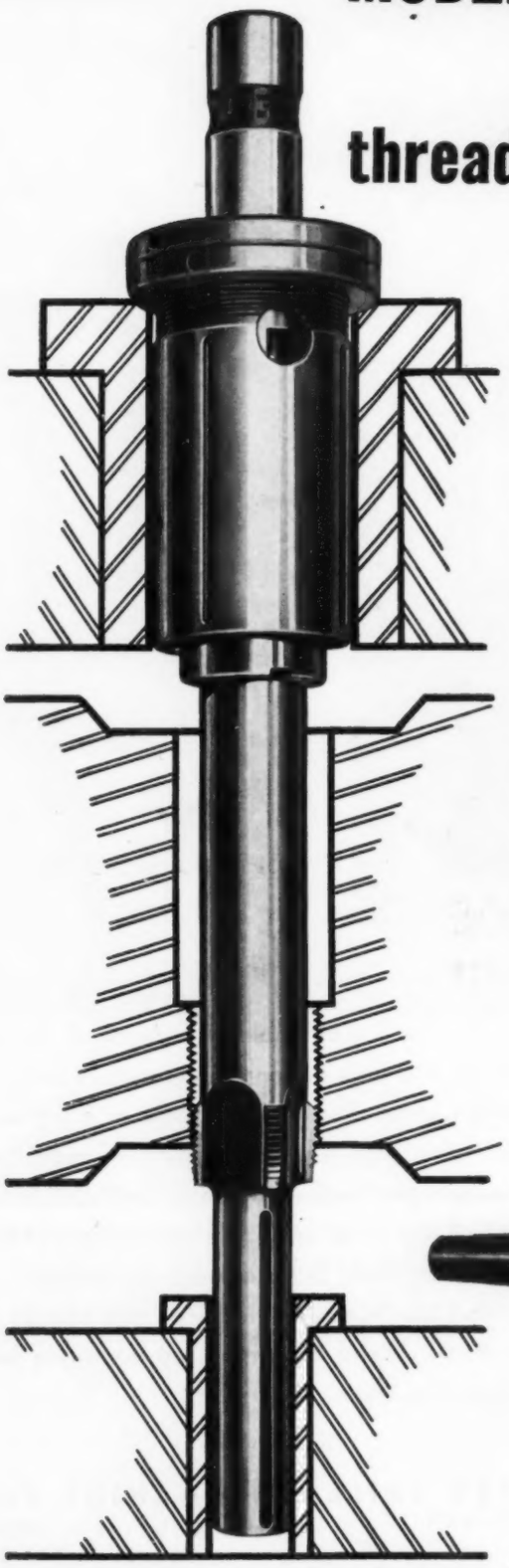
Showing three of a battery of five 4-spindle Avey Drilling Machines now engaged in producing small parts for our rapidly expanding armed forces.

● The Avey four spindle drill in the foreground is drilling one 1/4" hole, one 51/64" hole to a depth of 9/16" then reams latter .812 inch dia and counter-sinks bottom of hole in clutch lever. The piece is held in a jig and moved along table for each operation—production averages 20 pieces per hour—tolerance limit .002 inch. This is typical of the time and cost saving operations being performed on Avey Drills throughout industry. If yours is a drilling job from .010 to 1 1/4" you can do it better on an Avey. Write for details on complete line of Avey Drilling Machines.

AVEY DRILLING MACHINE CO.
CINCINNATI . . . . . OHIO

Avey DRILLING MACHINES
CINCINNATI · OHIO

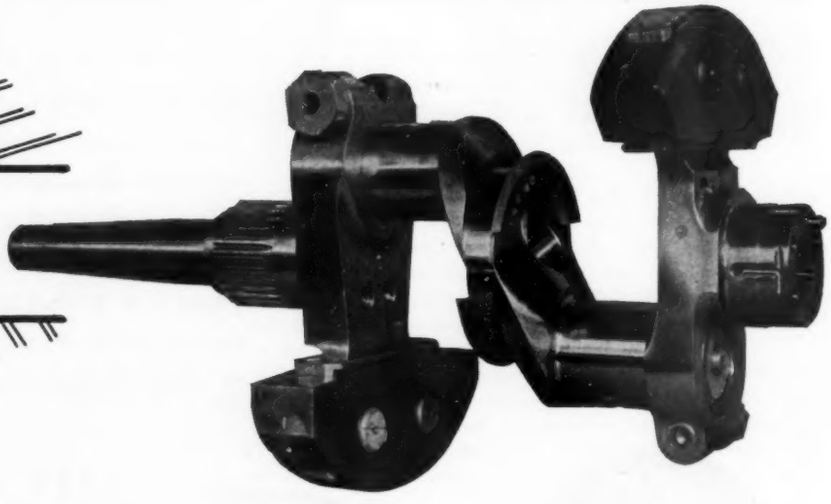
MODERN Piloted Collapsible Tap Speeds up threading on airplane crankshafts



Here is just one case where MODERN Collapsible Taps have speeded up threading operations by saving the reversing time formerly necessary. Rough tapping the thread in chrome nickel crankshaft ends is accomplished quickly and accurately with this special piloted MODERN Collapsible Tap that leaves the thread unmutilated and unmarked.

That's because there's no reversing this tap. When the thread is cut the chasers automatically collapse allowing the tap to be withdrawn. Then too MODERN chasers can be resharpened time and time again and tap adjusted to cut diameter desired.

Whether your tapping jobs are ordinary blind hole or thru hole tapping that would use the Standard MODERN Collapsible Tap or special jobs like this one that require a piloted tap, MODERN may be able to speed up your work. Ask us.

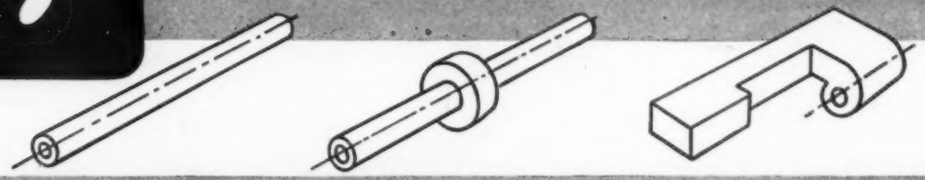


MODERN TOOL WORKS

DIVISION OF CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER **NEW YORK**

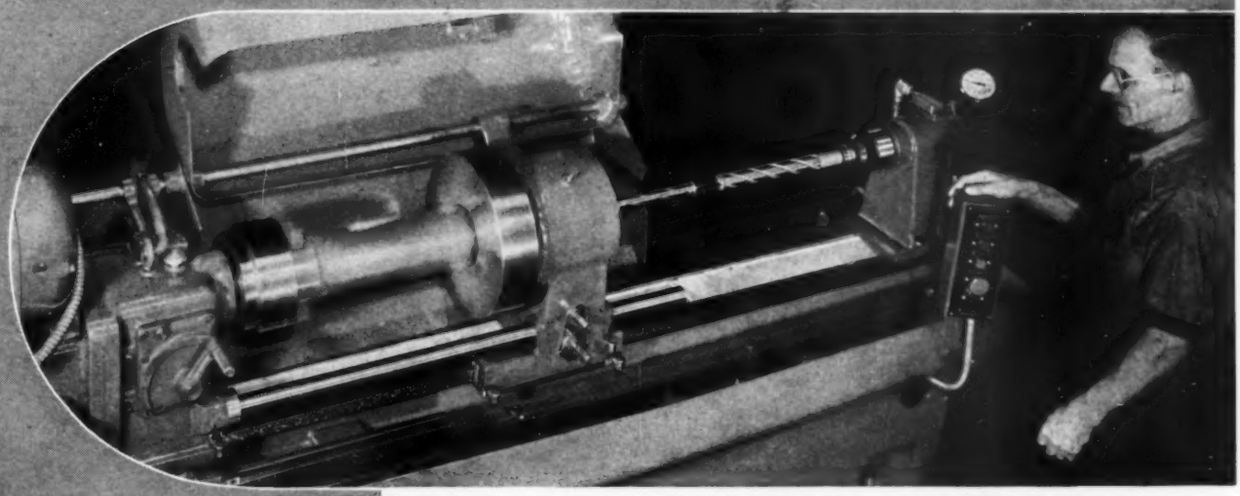
Now! A RIFLE DRILLER FOR PARTS LIKE THESE



Hollow shafts up to 47" long —used in aircraft engines, tank engine components, and gun components.

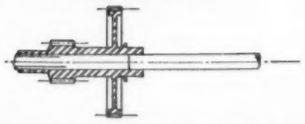
Impeller shafts, gear blanks, hollow gear clusters etc.—used in aircraft and tank engine components, gun mounts, etc. Max. 20" outside diameter.

Non-symmetrical parts (Gun Components Etc.) requiring deep hole drilling are accommodated through the use of cradle-type fixtures.

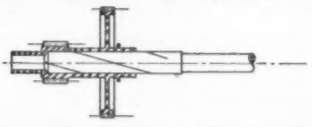


First experimental model of our No. 410 single sipndle deep hole drilling machine. The machine is shown while taking test reaming cuts on two different diameters simultaneously. Below is shown the new improved 9 speed No. 410 drilling machine.

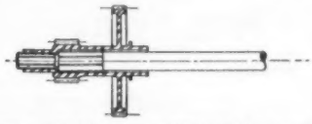
Typical Operation Sequence



1st Operation: Rifle drilling straight through from solid. Stock left for removal in second operation is .487".



2nd Operation: Re-drill or core drilling operation to predetermined depth. Stock left for finish reaming is .015".



3rd Operation: Finish ream 2 different diameters. Approximately one minute is used for loading and unloading in each operation (done in lots). Total production is approximately 3 pieces per hour.

W. F. & JOHN BARNES ROCKFORD ILLINOIS

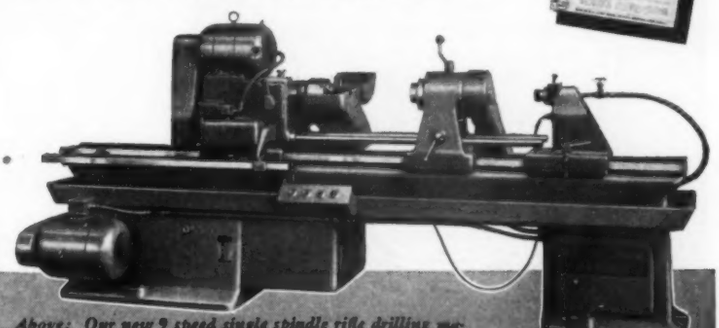
IMPROVE FINISH-DRILL STRAIGHTER HOLES-LOWER TOOL MAINTENANCE COSTS

This new machine has been designed and developed especially for *rifle drilling odd parts* common to many divisions of ordnance and aircraft work.

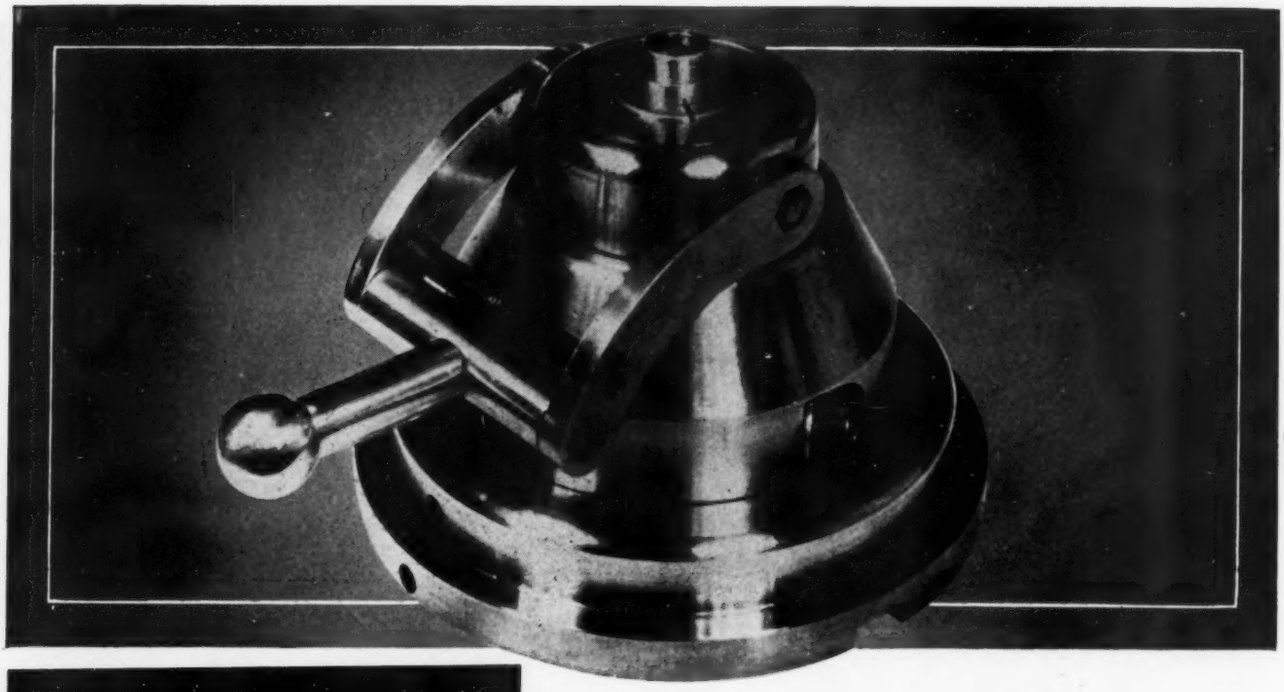
Rough reaming operations are often eliminated due to superior finish obtained with single-lipped rifle drills. These drills are also capable of drilling straighter holes than possible with conventional drills. The machine is equipped with torque overload for tool protection and a high pressure coolant system. Both contribute to better production and lower tool maintenance costs. This machine can be tooled for drilling from solid, core-drilling, reaming and counterboring operations.

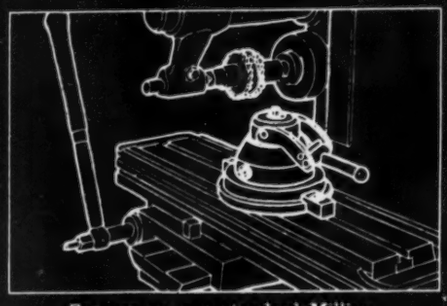
CAPACITY: Furnished in strokes of 24"—36" or 48" maximum. Nine spindle speeds (91 to 1347) are provided, powered with a 5 HP motor. Drilling from solid 1¼" dia. max.

FREE RIFLE DRILLING DATA: Complete specifications will be sent upon request. In addition, write for the 420 bulletin covering deep hole drilling and boring operations of larger parts such as gun barrels. Ask for bulletins AMS-410 and AM-3-420.

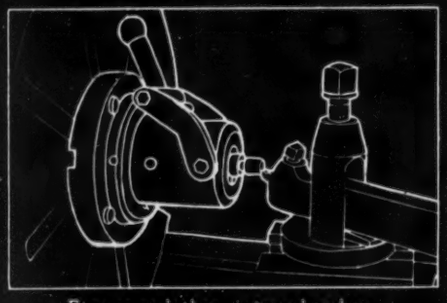


Above: Our new 9 speed single spindle rifle drilling machine. This machine is in successful operation in many plants manufacturing parts similar to those shown above

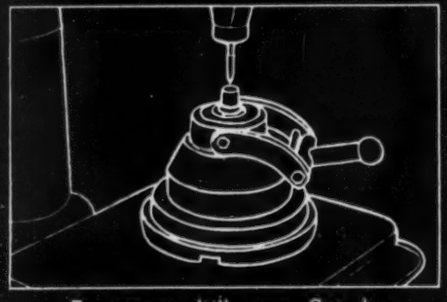




For use on any standard Milling Machine to mill slots, hexes, keyways, punches, taps and many other operations.



For use on lathes, internal and external grinders. Convert same into a rapid production unit.



For use on drill press. Can be mounted horizontally or vertically.

Announcing

"ZAGAR"
COLLET CHUCKING
and
HOLDING FIXTURES

Designed for Milling . . . Turning . . . Drilling . . . and Tapping.

Speed — just one handle to open, close and index collet.

Simplicity — easy to set up. Indexes from 2 to 16 may be obtained on separate index plates mounted with two Allen Screws.

Durable and Accurate—made of hardened and ground steel throughout and are guaranteed to withstand the abuse of high production.

Two sizes — 1″ and 2″ using Standard W & S Collets or may be furnished to fit any collet. Furnished either with or without indexing.

TEN DAY FREE TRIAL

Prices

1" Holding $75.00	**2" Holding $125.00**
1" Indexing $150.00	**2" Indexing $250.00**

Write for full descriptive literature.

ZAGAR TOOL, INC.

23880 Lakeland Boulevard

CLEVELAND • • • • OHIO

MASTERS of PRECISION

CLEEREMAN Jig Borers and the men who build them are masters of precision. Design, selection of materials, fabrication, assembly, inspections, and tests are all performed with one purpose in mind—to build precision machines that will turn out precision work at low cost for many years after purchase.

Users know that CLEEREMAN men and CLEEREMAN Jig Borers are masters of precision.

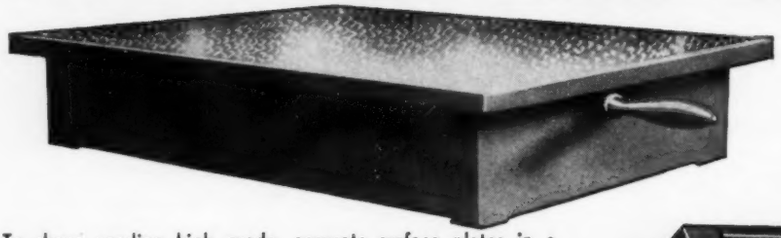
Jim Le Clair—master craftsman—testing the precision of a CLEEREMAN Jig Borer spindle.

Bryant Machinery & Engineering Company
Sales Division: **Cleereman Machine Tool Co.**
400 W. Madison St. • Chicago, Ill., U. S. A.

CLEEREMAN

DRILLING MACHINES and JIG BORERS

Accurate SURFACE PLATES



for Prompt Delivery!

Lombard Surface Plates are ideal for general shop inspection or first piece production inspection.

Extreme accuracy of Lombard Surface Plates is maintained indefinitely through heavy ribbing and 3-point suspension.

To shops needing high grade, accurate surface plates in a hurry, Lombard offers outstanding opportunities to meet those needs promptly. We are geared to produce these plates to the highest degree of precision where extreme surface accuracy is required.

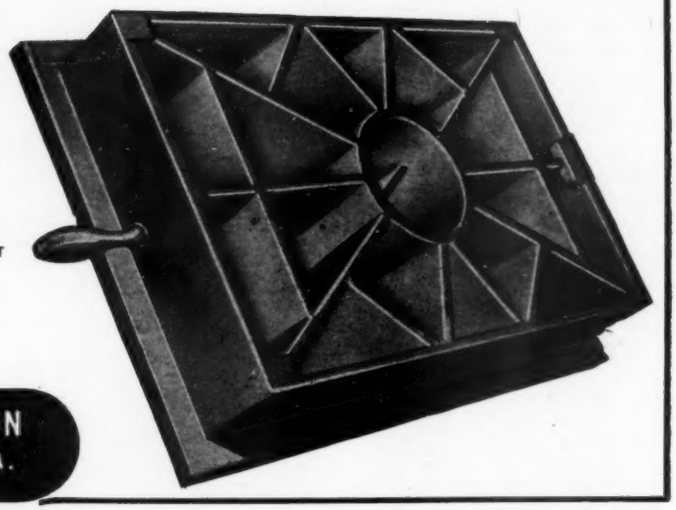
Lombard Surface Plates are specially heat treated to relieve casting and machine strains. They are of extra rigid and heavy construction and carefully hand scraped to insure the closest limits of maintained accuracy.

Available also with planed and hand lapped surfaces. Standard sizes available as follows:

SIZE	WEIGHT	SIZE	WEIGHT
14"x18"	95	*36"x48"	1150
18"x24"	190	48"x48"	1700
24"x24"	295	*48"x72"	3750
24"x36"	450	60"x72"	4850
24"x48"	900	*48"x96"	6550

*Made to Order only

WRITE FOR DETAILS & PRICES



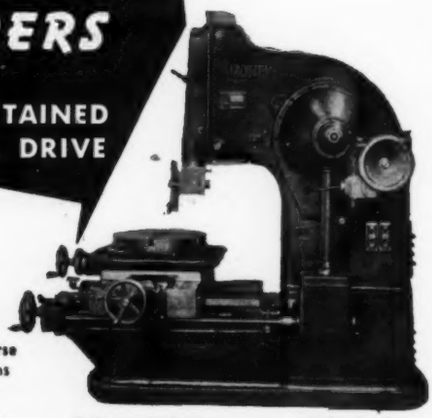
LOMBARD GOVERNOR CORPORATION
200 MAIN ST. ASHLAND, MASS. U. S. A.

Accurate, High-Speed

MOREY VERTICAL SHAPERS

8" STROKE
12" STROKE

SELF-CONTAINED MOTOR DRIVE



power rapid transverse feeds in all directions

Timken Tapered Roller Bearings for Main Spindle—all others anti-friction.

Built to highest accuracy standards the MOREY VERTICAL SHAPER is simple for tool-room manufacturing. Power feeds and power rapid transverse feeds in all directions are instantly available in all operating positions.

Ask for Circular 726

MOREY MACHINERY CO., INC.
410 Broome Street New York, N. Y.

HIGH TAPPING PRODUCTION with Unskilled Labor on this

Ettco-Emrick FOOT-OPERATED TAPPING MACHINE

2400 accurately tapped holes per hour is easy on this foot-operated machine with the standard 2-spindle head as illustrated—and up to *12,000 per hour* with available Ettco-Emrick Multiple Tapping Heads.

Unskilled labor can do it because Ettco-Emrick design *eliminates the human element from the actual tapping operation.*

WRITE FOR THESE BULLETINS

BULLETIN No. 4 gives full details about the machine and **BULLETIN No. 3** covers the multiple tapping heads. Copies mailed on request.

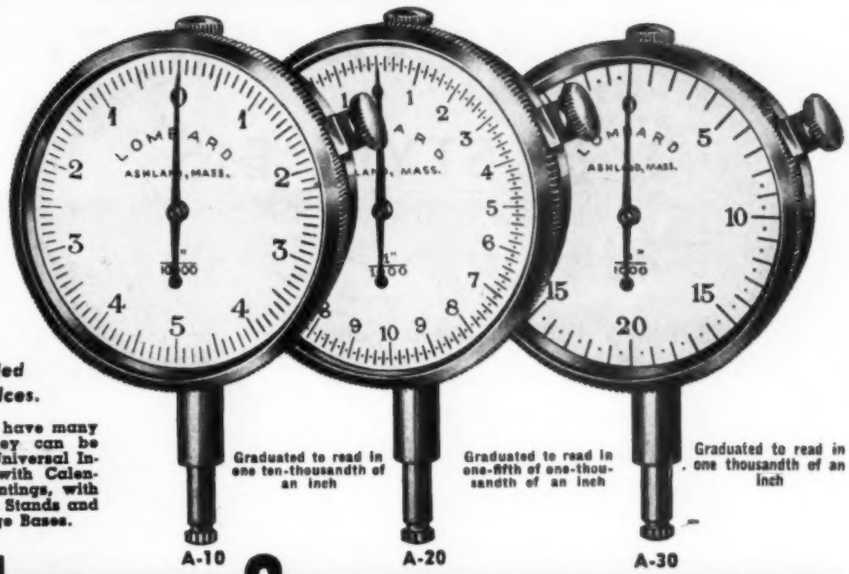
ETTCO TOOL CO., Inc.
590 Johnson Ave., Brooklyn, N. Y.
Detroit • *Chicago*

MAKERS OF *Ettco-Emrick* DRILL CHUCKS • TAP CHUCKS
MULTIPLE TAPPING AND DRILLING HEADS
TAPPING ATTACHMENTS • TAPPING MACHINES

LOMBARD DIAL GAUGES

The fine Lombard standard of craftsmanship is inherent in these "A" type indicators, ruggedly constructed to give long, accurate service. Brass gears and cases are used throughout. The spindles are of stainless steel. Solid front and back plates applied directly to the case eliminate need for dowels and assure longer gauge life and accurate repeat readings. Furnished with lug back as standard, but plain back will be supplied if desired. Illustrations ¾ actual size.

Write for detailed information and prices.



A-10 — Graduated to read in one ten-thousandth of an inch

A-20

A-30 — Graduated to read in one-fifth of one-thousandth of an inch

Graduated to read in one thousandth of an inch

Lombard Junior Gauge

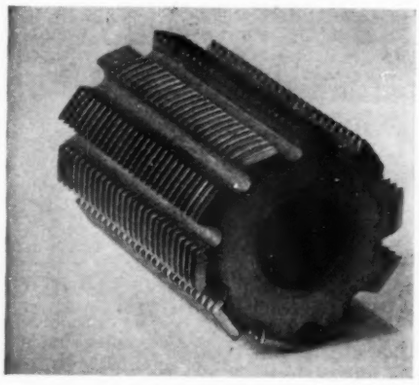
Designed for use on small fixtures 1¼" Dial. Reads to half thousandths

A-J-5

These indicators have many applications. They can be furnished with Universal Indicator Stands, with Calendar Gauge Mountings, with Thickness Gauge Stands and with Depth Gauge Bases.

LOMBARD GOVERNOR CORPORATION
ASHLAND, MASSACHUSETTS, U. S. A.

MULTIPLE THREAD MILLING HOBS



. . . In Any Thread System, Any Thread Angle, or Thread Form . . . Either in Inch or Metric Scale . . . Left or Right Hand Threads

FREE OF DISTORTION

In Dimensions up to 5¼" O.D. and up to 3" Thread Length for

INTERNAL OR EXTERNAL THREADING

HOBS PRODUCED BY METHODS RESULTING FROM MORE THAN 25 YEARS EXPERIENCE IN PRODUCTION OF THREAD HOBS.

• • •

FOR FURTHER INFORMATION COMMUNICATE WITH

INNOVATION

On special desire:

Thread hobs either shank-, taper-, or shell type cut in absolute conformity with thread form of inspection gauges thus eliminating any discrepancy between their thread form and the form of the finished work piece.

Eliminates inspection rejections on finished parts involving loss of material or labor.

An economical method to speed up production without sacrificing accuracy of work.

U. S. MACHINE TOOL MFG. CORP.

100 So. 6th St.
TERRE HAUTE, IND.
Telephone: Crawford 1725

OUR MIDGET *THREADING TOOL . . .*

3/16" STYLE EJ5

SPECIFY EJ5 Geometric Solid Adjustable Die Head for small diameter, fine pitch threads . . . 1/16″ to 3/16″ . . . Pitches as fine as 100 per inch.

CUSTOMERS' COMMENTS: —

"Threaded 103,000 pieces without grinding chasers."

"Cuts Class 3 Fits without choosing among a quantity of solid or spring dies."

"Cutting No. 4-40 threads obtained over 4000 parts on Stainless Steel without a grind."

POPULAR on all sorts of small diameter threading, such as . . . Cameras . . . Watches . . . Eyeglasses . . . Fine Instruments . . . Business Machines.

FORWARD FLOATING SHANK compensates for slight variations in the camming.

CHASERS EASILY ADJUSTED to cut within close tolerances.

CUTS CLOSE TO SHOULDER—Projection chasers furnished as standard.

EASY TO RESHARPEN . . . (CHASERS CAN BE REMOVED FROM DIE HEAD).

LONG THREADING LIFE AND CONTINUED ACCURACY!

★ ★ ***More Threads For Every Dollar Spent*** ★ ★

THERE ARE OTHER APPLICATIONS OF THE TOOL—Write for our catalogue.

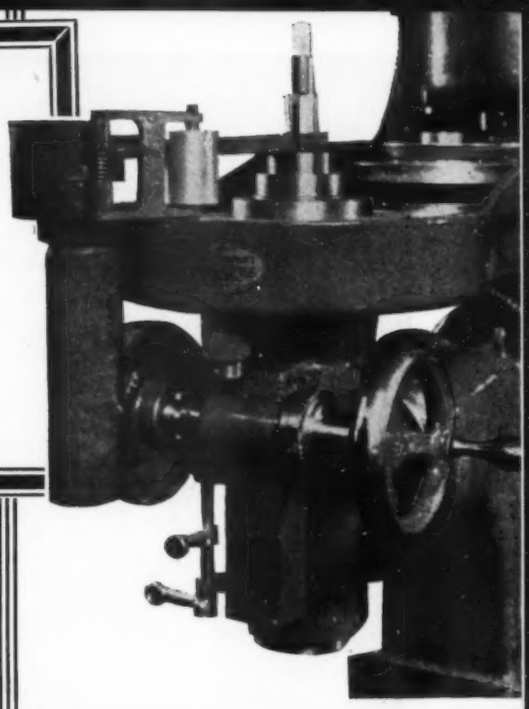
THE GEOMETRIC TOOL COMPANY

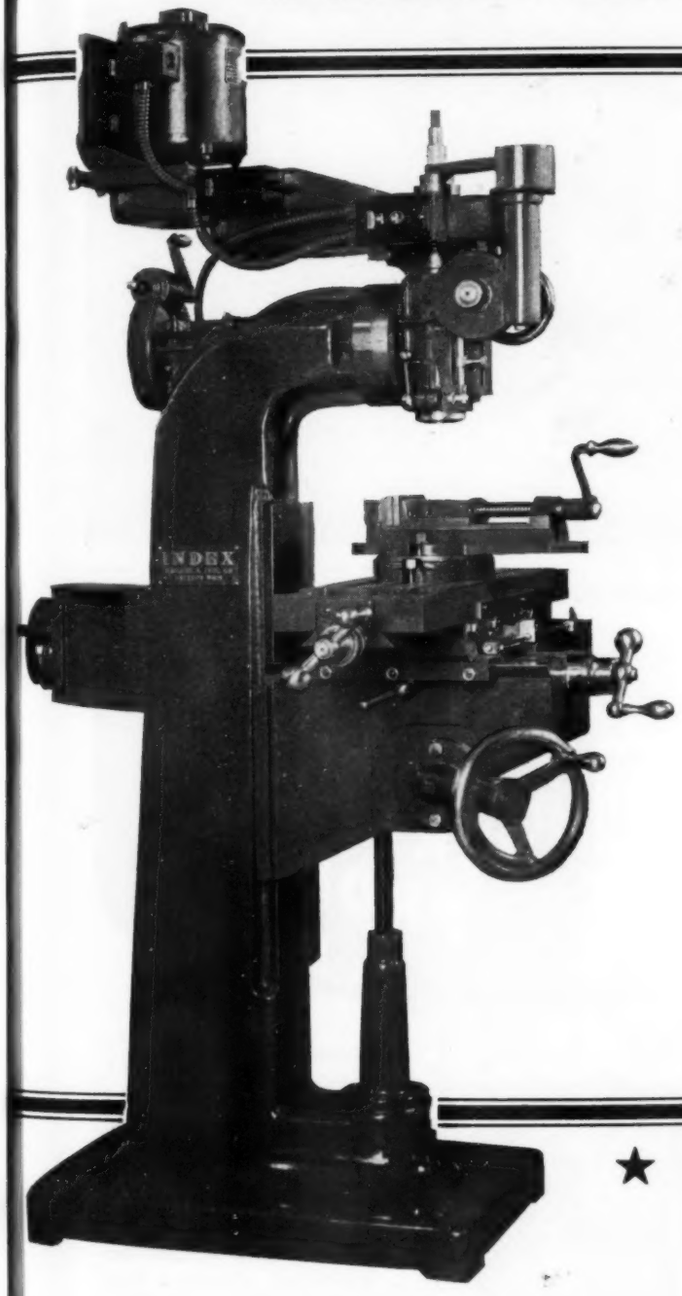
NEW HAVEN, CONN.

NEW →

Power Feed to the Spindle on

INDEX MILL





● This addition to the Index Mill is the result of many requests from production men who use the machine for jig boring. For complete details send for our new illustrated folder.

● Index Mills hold a prominent place in the Victory program . . . working night and day in plants making planes, tanks, submarines, cameras, machine tools, etc.

The performance of Index Mills in those plants has brought a constant stream of repeat orders.

Index Mills can now give even better performance. With the new power feed to the spindle, Index Mills deliver better work, faster and with less fatigue to the operator.

The spindle of the Index Mill is built for hard continuous service. It is guaranteed for one year without further attention. Verniers are standard equipment for precision locating.

Reasonable delivery. And reasonable price. Write today for new illustrated folder.

★

BLANK & BUXTON MACHINERY CO.

3106 E. MICHIGAN AVE., JACKSON, MICH.

WRITE for our NEW illustrated folder

Why put small jobs on big shapers?

Today's orders demand *fast* accurate production. Vernon 11" Precision Shapers are producing small defense parts as speedily and as accurately as large machines—yet at a fraction of the operating cost. Here's a *low-priced* machine tool that snaps the bottle-neck in your production and relieves larger machines for heavier jobs.

Precision made from top to bottom, this shaper includes many features usually found only in higher priced equipment . . . such as automatic cross feed (both directions) . . . helical cut bull gear . . . fully enclosed variable drive . . . heavy, well-ribbed construction . . . accurately fitted, hand-scraped sliding surfaces.

The Vernon 11" Shaper is distributed through dealers in every important industrial area. Your request on a postcard or letterhead will bring detailed folder — write today.

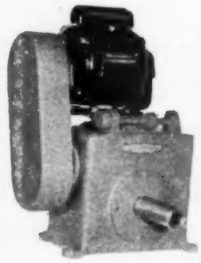
Vernon Heavy-Duty Back-Geared 12" ⇦ Precision Shaper
Recommended for precision tool room use and production jobs requiring extreme power.

MACHINERY MANUFACTURING COMPANY
1915 EAST 51 ST., VERNON :: LOS ANGELES, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

POPULAR PRICED
VERNON
11" PRECISION
SHAPER

REAMING! DEBURRING! CHAMFERING! FINISHING!

THE CATSKILL POWER REAMER



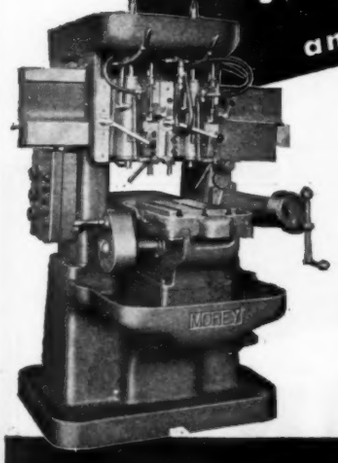
A compact production tool that will save many times its cost. Speeds up removal of burrs from tubing as well as from bores and keyseating or drilling of set screw holes. Saves time, eliminates tedious hand reaming. Saves on finish reaming, countersinking, smoothing off and chamfering sharp edges off bar or tube stock and many other finishing jobs. Moderately priced. A number of units may be spotted at exact locations of last operations.

Write for details and prices.

CATSKILL METAL WORKS, INC.
CATSKILL NEW YORK

Preloaded Precision Bearings for Spindles

MOREY 12M HIGH-SPEED VERTICAL PROFILER and MILLER

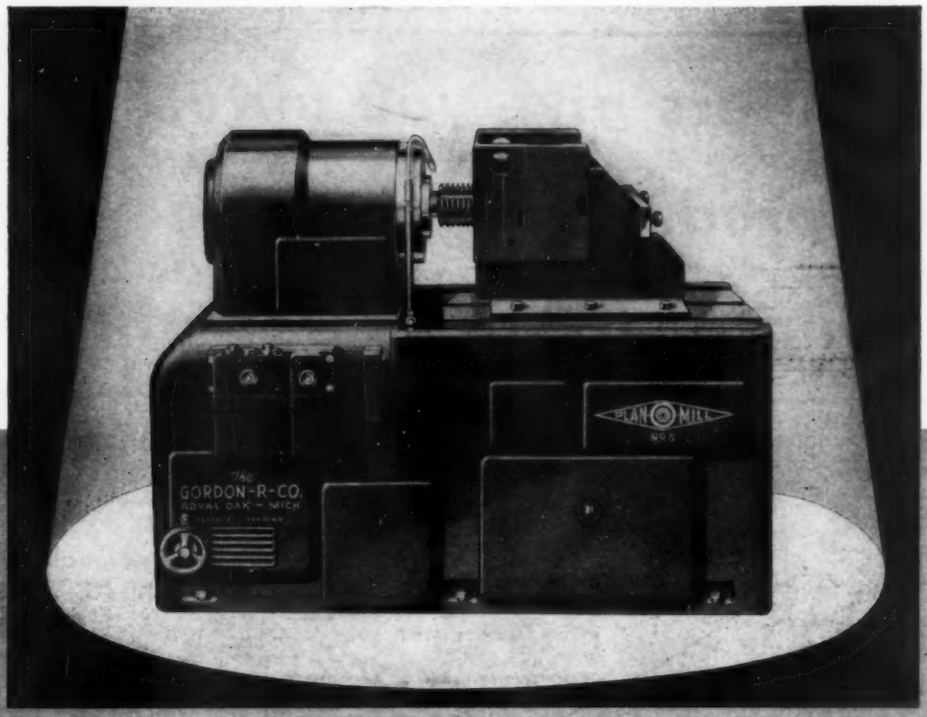


Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

MOREY MACHINERY CO., INC.
410 Broome Street New York, N. Y.



Announcing NEW, IMPROVED HYDRAULIC PLAN-O-MILL FOR AUTOMATIC THREAD- AND FORM-MILLING

● **In this larger, heavier PLAN-O-MILL all the recognized advantages of planetary milling have been retained and exceptional flexibility has been added. To perform any specific job, cutting speed, rate and depth of feed can easily be adjusted by the simple twist of a dial. Once set up future operations are automatic.**

Fixtures designed by Gordon-R engineers permit a wide range of applications. Breech blocks, breech rings, cylinder heads, propeller hubs and blades, and gun barrels are among the many vital military parts speedily and economically machined. Worry-free precision meets tolerances easily.

By combining in one machine the exceptional accuracy of planetary milling with the flexibility of hydraulic operation, *hydraulic* PLAN-O-MILL offers arms manufacturers five important economies: (1) relatively low cost, (2) economy of weight, (3) economy of floor space, (4) more economical use of manpower, (5) greater production economy.

Specifications and operating procedure, together with full explanation how Gordon-R production engineers can serve you, will be rushed upon receipt of letter, wire, or telephone message.

DO YOU KNOW—

how* plan-o-milling—*the modern method of thread- and form-milling—can give you more perfect parts at lower cost per part? The BIG story of* plan-o-milling *—what it does and how it does it—is clearly and simply told in a few words in "Just Push the Button". Send for your free copy.

The GORDON-R CO.

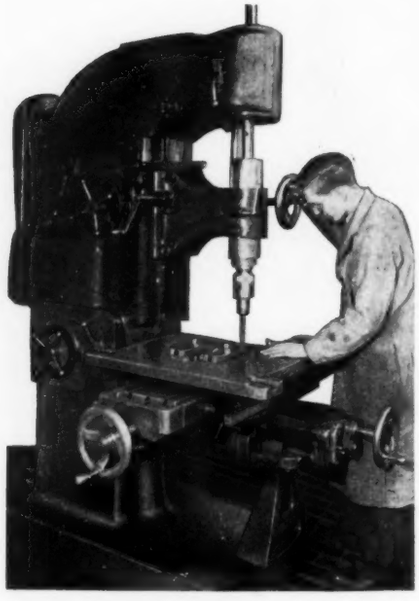
625 WASHINGTON SQUARE BUILDING

Manufacturers of

PLAN-O-MILL

ROYAL OAK, MICHIGAN

KNIGHT Millers *give you a definite speed and production advantage for many Milling and Boring Operations*



- Balanced design makes KNIGHT Millers adaptable to a wide variety of work.
- This balanced design includes CAPACITY which enables users to turn out quality work at greater speed.
- Plus this there is ACCESSIBILITY which make possible more efficient operation—faster manipulation, and quicker set-ups.
- To also aid in increasing production volume and insuring high standards of workmanship, RIGIDITY has been built into the design.
- KNIGHT VERSATILITY gives these Millers capabilities which greatly simplify many set-ups that would otherwise be difficult to obtain.
- Added to all this is ACCURACY that helps you turn out quality jobs.

THE KNIGHT MILLER IS AN *All-Purpose* MILLING MACHINE

It has sufficient power to take the heavy cuts—it has the rigidity and accuracy necessary to insure highest quality results—it has sufficient speed to make possible the use of both large and small cutters so that both light and heavy work can be done to equal advantage.

Some of the KNIGHT possibilities

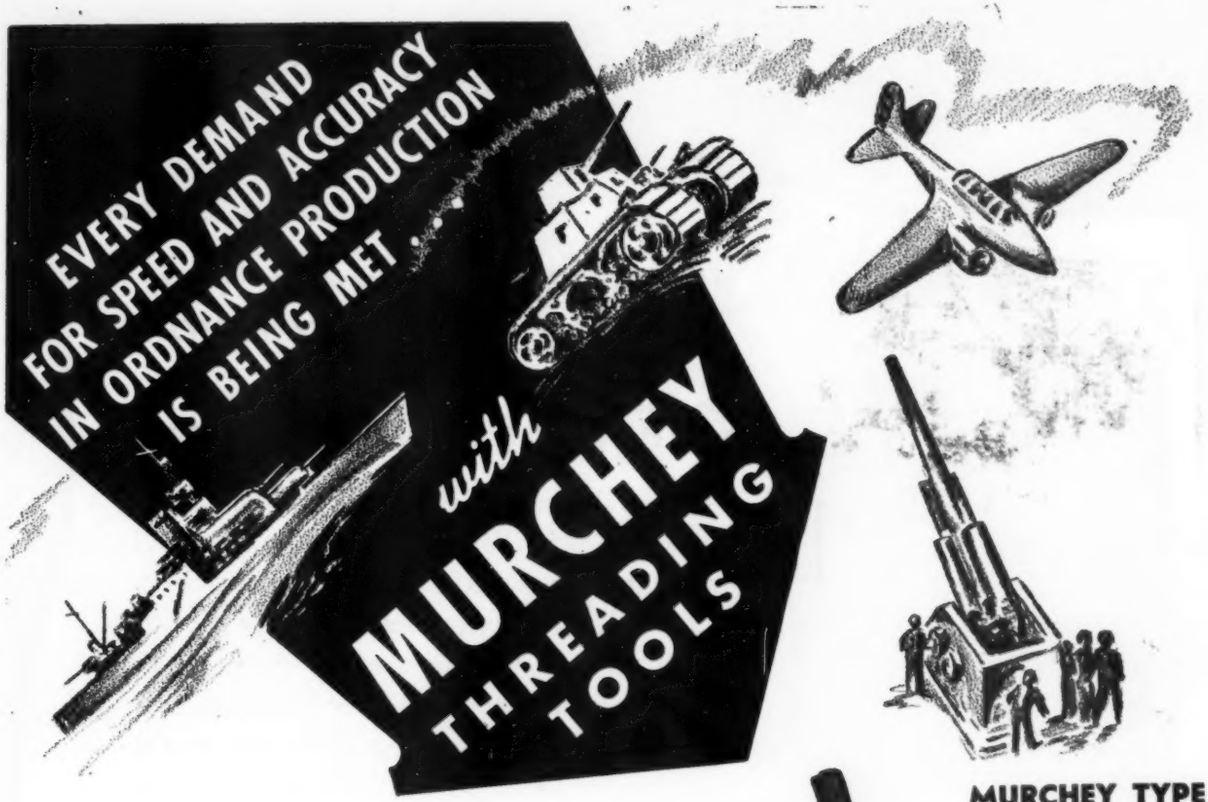
You can rough and finish difficult forms easily, quickly, and with minimum adjustments in one setting in doing die and mould work.

Costs on experimental work are greatly reduced because you can machine many jobs completely on this one machine and handle difficult operations without special equipment.

For limited and special production you can keep costs down and maintain quality without special tooling. This is because the tilting table with Dial Indicators act as a Universal Jig and Fixture built into the machine.

Write for New Catalog NOW - -

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •



Murchey Tools—designed and built for fast, low cost, accurate thread production—are fulfilling the most exacting requirements in plants busily engaged in turning out arms and ammunition at top speed.

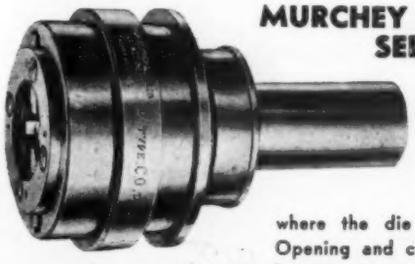
Long since proved for economy and stamina under normal production demands, Murchey Tools, by their outstanding performance in today's production race, are demonstrating their soundness in design and construction for tough service. Consult Murchey on your defense production threading problems.

MURCHEY ALSO MANUFACTURES
Thread Milling Machines, and Shell Tapping Machines.
Write for detailed information.

MURCHEY TYPE "M" COLLAPSIBLE MACHINE TAP

This universal tool—for tapping straight threads—provides instant, positive release. It is fast in action and cuts threads to accurate length under all conditions. Sturdy, strong and adjustable for thread sizes, the Type "M" is a fast tool on any thread cutting job.

MURCHEY TYPE "C-O" SELF-OPENING DIE HEAD

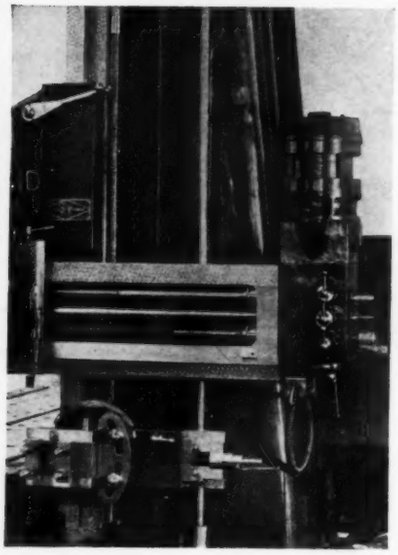


This rugged, compact tool is designed for use on any machine where the die head is revolved. Opening and closing are positive; opening at predetermined point guarantees accurate thread lengths. All parts are hardened and ground. Simple and sturdy in construction, the Type "C-O" assures long-lived service and accurate performance.

Investigate Today!

Murchey MACHINE & TOOL CO.
.....DETROIT, MICHIGAN

CLEVELAND *Open Side* PLANERS



"NEW SERIES" *Shows Real Progress in Construction*

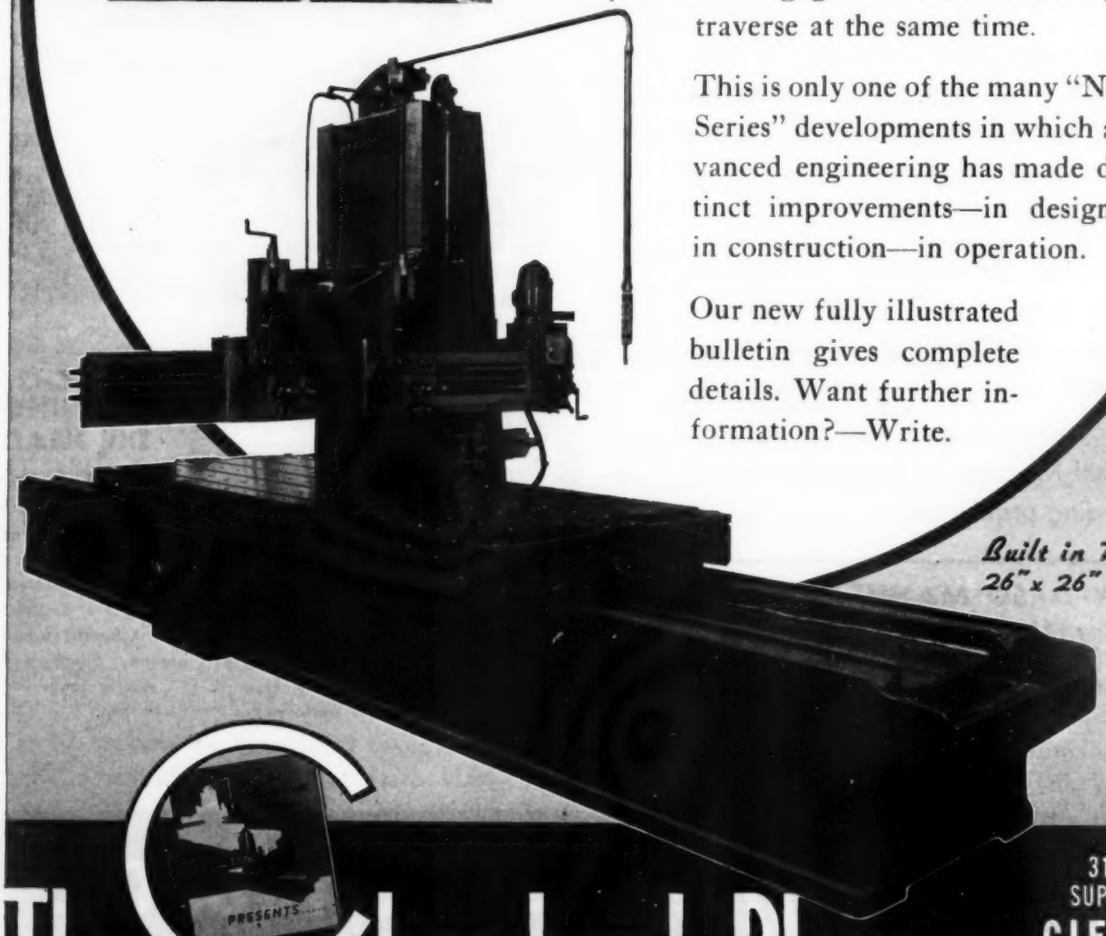
FOR EXAMPLE—

ELECTRIC RAPID TRAVERSE

The new Electric Rapid Traverse on Cleveland Open Side Planers is a separate electrical unit and is controlled by a pistol grip switch. This is a conveniently located, handy type of switch making it easy for the operator to have complete control of traverse movements instantly. It also provides a safety factor as it is impossible to engage the feeds and the rapid traverse at the same time.

This is only one of the many "New Series" developments in which advanced engineering has made distinct improvements—in design—in construction—in operation.

Our new fully illustrated bulletin gives complete details. Want further information?—Write.

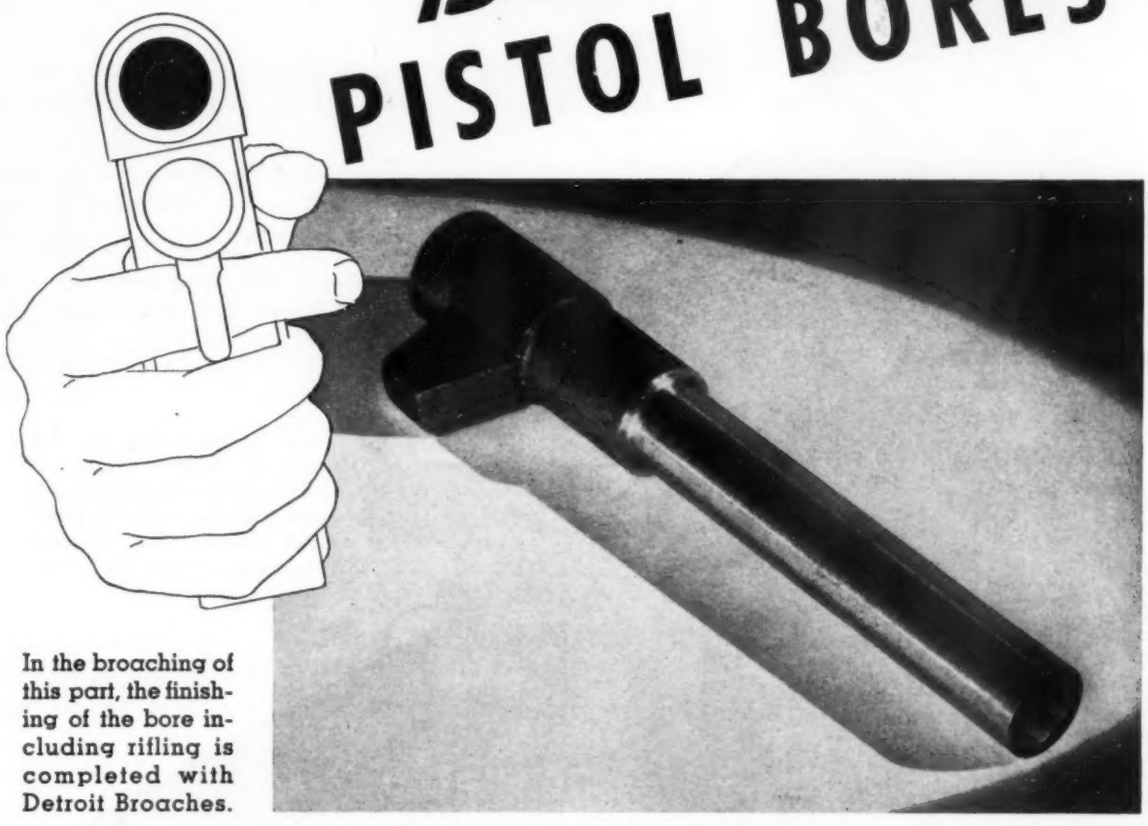


Built in 7 sizes from 26" x 26" to 72" x 72"

The Cleveland Planer

3148 - 3156
SUPERIOR AVE.
CLEVELAND
OHIO

THE AXIS FACES *Broached* PISTOL BORES



In the broaching of this part, the finishing of the bore including rifling is completed with Detroit Broaches.

With the steadily increasing volume of production of small arms, broaching is playing a vitally important role in reducing the time required for many cutting operations. In the finishing of pistol bores, for instance, Detroit Broaches are in constant use . . . completing thousands of these internal surfaces with precision accuracy.

For the broaching of both external and internal forms in innumerable parts now used for armament purposes, Detroit Broaches continually meet the most exacting requirements.

DETROIT BROACH COMPANY
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN

"We're Swaging—

100 AXLE HOUSINGS

PER HOUR *with our new* ETNA . . ."

**SAYS D. F. ROBY, VICE-PRESIDENT,
AMERICAN METAL PRODUCTS COMPANY**

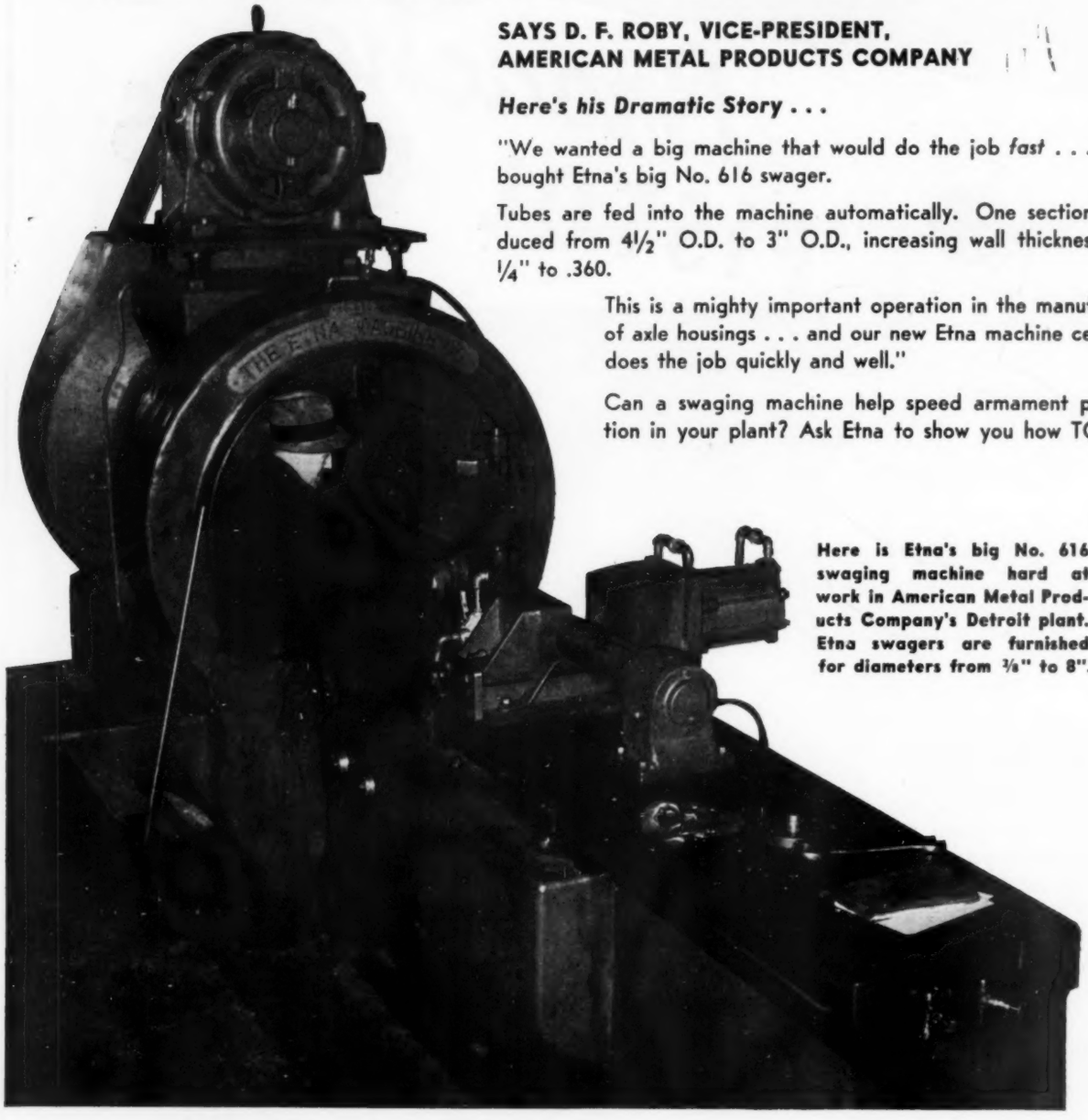
Here's his Dramatic Story . . .

"We wanted a big machine that would do the job *fast* . . . so we bought Etna's big No. 616 swager.

Tubes are fed into the machine automatically. One section is reduced from 4½" O.D. to 3" O.D., increasing wall thickness from ¼" to .360.

This is a mighty important operation in the manufacture of axle housings . . . and our new Etna machine certainly does the job quickly and well."

Can a swaging machine help speed armament production in your plant? Ask Etna to show you how TODAY.



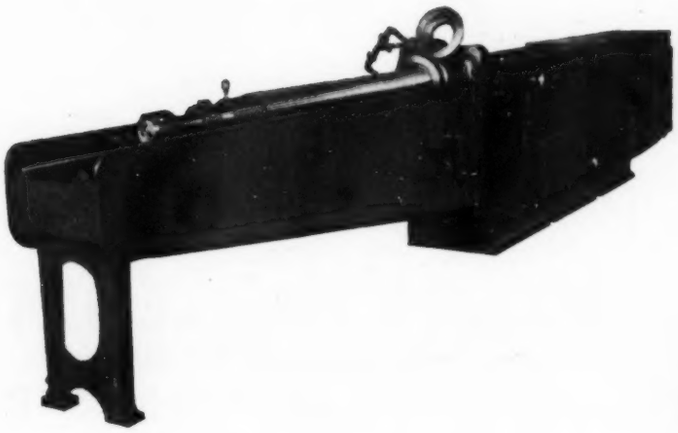
Here is Etna's big No. 616 swaging machine hard at work in American Metal Products Company's Detroit plant. Etna swagers are furnished for diameters from ⅜" to 8".

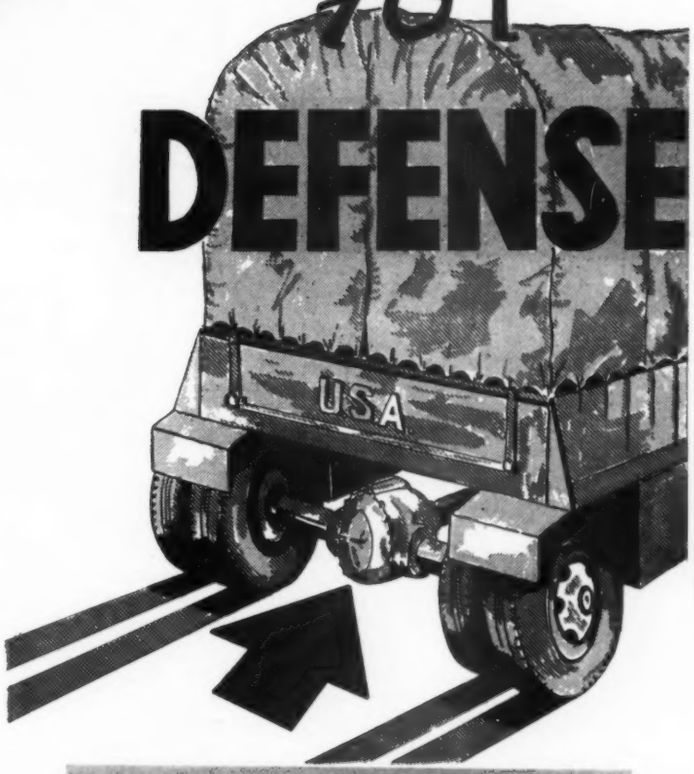
"Ask ETNA about Swaging"

**THE ETNA
MACHINE COMPANY**

TOLEDO . . . OHIO

650% increase for DEFENSE



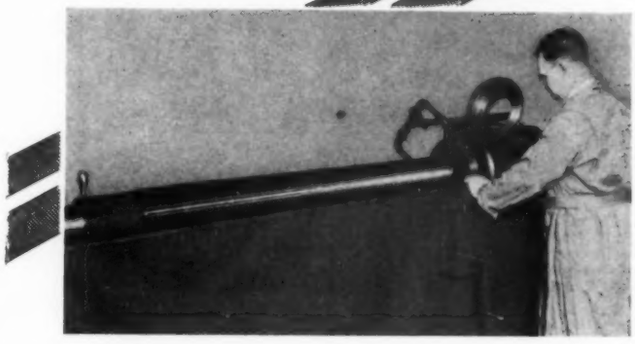


The AMERICAN Horizontal Hydraulic Broaching Machine shown above was furnished complete with tooling for broaching 46 involute gear teeth $\frac{1}{4}$" deep through $1\frac{5}{8}$" length of steel bevel drive gears used in army truck differentials. The pitch diameter of gears broached is 6 9/16 inches.

Previous production of this part required 3 men and a battery of 9 special machines. The AMERICAN Broaching Machine now employed is a standard H-30-66 having 30 ton capacity and 66" stroke. It is equipped with outboard support and automatic broach support.

A single operator handles this AMERICAN machine and production of 15 pieces per hour is obtained.

This is a typical example of how AMERICAN has been able to break production bottle-necks in many instances in the manufacture of vital defense materials.



AMERICAN BROACH & MACHINE COMPANY
ANN ARBOR, MICHIGAN, U. S. A.
BROACHING MACHINES, PRESSES, BROACHING TOOLS, SPECIAL MACHINERY

Division of SUNSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

INDUSTRY'S *New* RIGHT HAND

WHAT IT IS... DENISON EQUIPMENT for APPLIED HydrOILics

WHAT IT DOES... Already, engineers here at Denison have adapted oil hydraulics to an amazing variety of operations — some of which were never before done by machinery; others which were done less efficiently by older methods. Today, reaching into almost every industry, it is doing many types of assembling, clamping, loading, lifting, handling, hauling, holding, tilting, testing, pushing, pulling, packing, pressing and so on. The field of HydrOILics is rapidly and constantly expanding . . . its limits have not even been approached.

WHAT IT OFFERS... We feel that HydrOILics offers more than efficient machinery, equipment, and parts for your production, processing or handling operations. It also offers you a highly flexible medium for working out improved materials-handling methods, new production techniques, the mechanization of functions that now involve waste motion and lost time — and other developments that will continue to push back the horizons of industrial progress. HydrOILics gives industry a new right hand, so to speak.

WHAT TO DO ABOUT IT... For one thing, when you need hydraulic equipment or parts of any kind, turn to Denison HydrOILics. Secondly, whenever you have an equipment problem or a special requirement that suggests, however remotely, the possibility of a HydrOILic solution, get in touch with our engineers. There are no strings to this invitation. Write for any information you desire!

THE DENISON ENGINEERING COMPANY
1164 DUBLIN ROAD COLUMBUS, OHIO

MILFORD PROFILE SAW

(The blade for all internal-external metal cutting)

HANGS THIS SIGN ON YOUR BASIC MACHINE TOOLS

Use a contour sawing machine, or any vertical, metal-cutting band saw machine equipped with Milford Profile Saw, for odd jobs of parts, special tools, dies, jigs, etc. You will make them to better advantage.

Milling machines, shapers, lathes, drill presses, or other production equipment, if used for such odd jobs — plays havoc with your schedules.

MILFORD PROFILE SAW helps you keep your basic machine tools doing straight production work.

You may have a band saw machine that can be adapted to Profile Sawing. If so, write us for directions. You will find it well worth while.

Write for a free sample of Milford Profile Saw, giving specifications of blade you now use, or description of cutting job and machine.

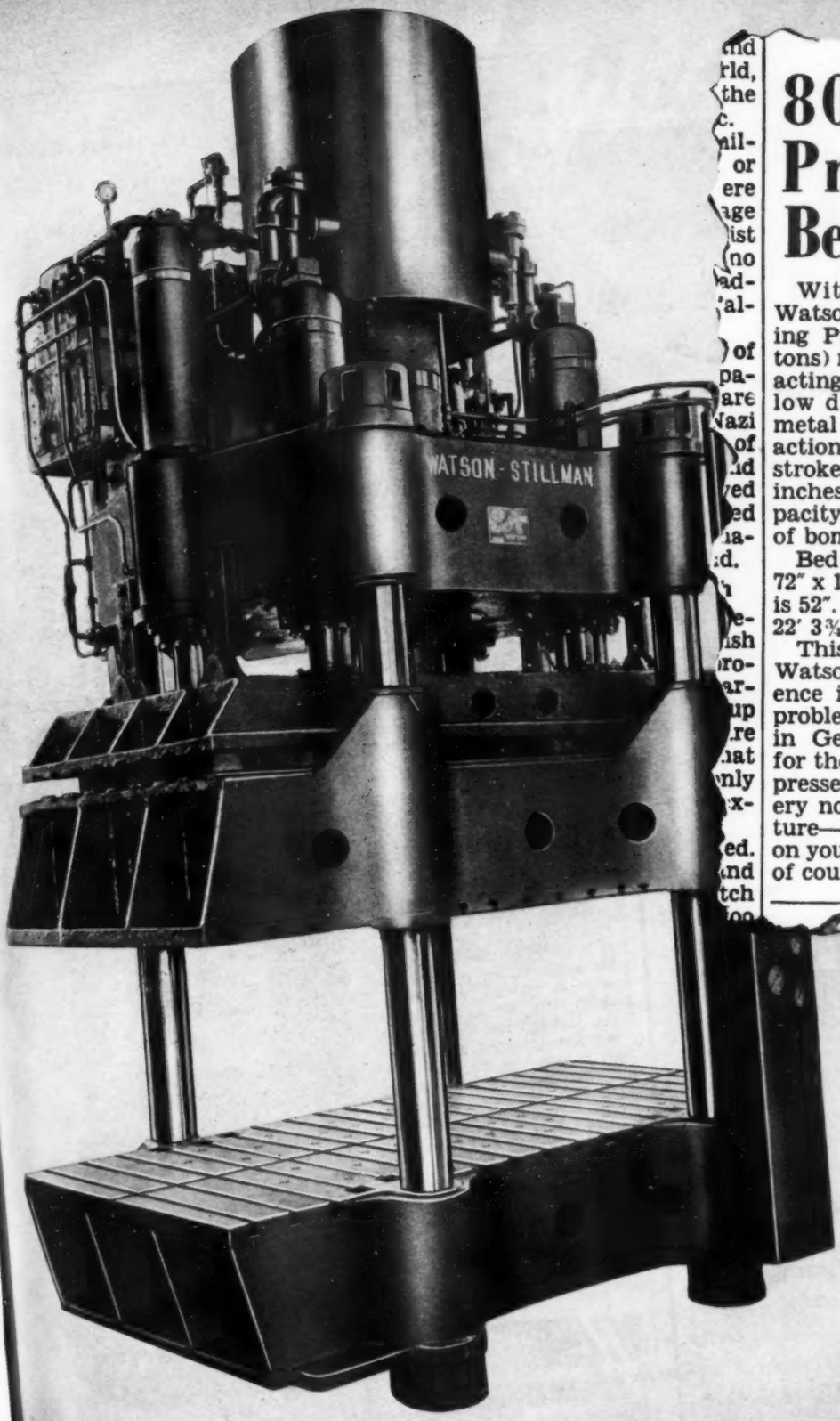
A machine for contour sawing is no better than its saw. Milford Profile Saw is made, and guaranteed by the world's largest, most experienced producer of metal-cutting band saw. Carried in stock by Mill Supply Distributors in every locality.

THE HENRY G. THOMPSON & SON COMPANY
NEW HAVEN, CONNECTICUT

MILFORD

★ PROFILE SAW ★

Also makers of REZISTOR HACKSAW BLADES

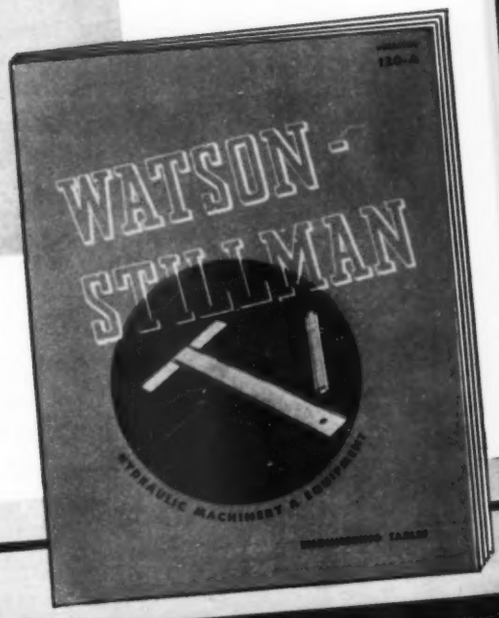


800-Ton W-S Press . . . For Better Bombers

With an 800-ton squeeze, this Watson-Stillman Hydraulic Forming Press (which itself weighs 70 tons) meets Lockheed Aircraft's exacting demands for deep and shallow drawing operations on thin metal parts for bombers. A double-action self-contained unit with a 43" stroke and a pressing speed of 14 inches per minute at 500-ton capacity, this press speeds production of bombers for the war effort.

Bed and moving platen measure 72" x 146". Opening between platens is 52". Overall height of the press is 22' 3¾".

This is but one example of how Watson-Stillman's 94 years' experience is solving today's production problems. Other examples appear in General Bulletin 110-A, yours for the asking. If you use hydraulic presses or other hydraulic machinery now—or if you may in the future—let W-S engineers go to work on your requirements. No obligation of course.



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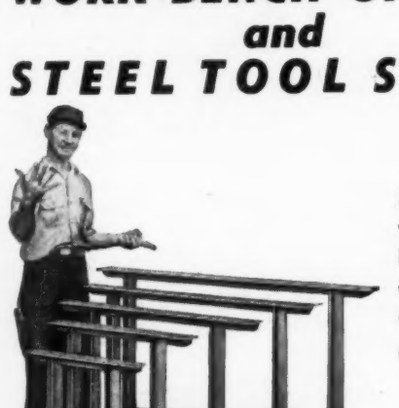

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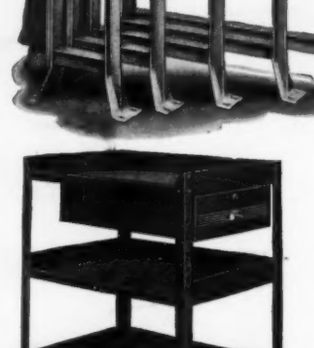

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Fig. 1851. Rugged all-steel construction and easy rolling Swivel casters, make these handy Tool Stands a lasting aid to shop efficiency.

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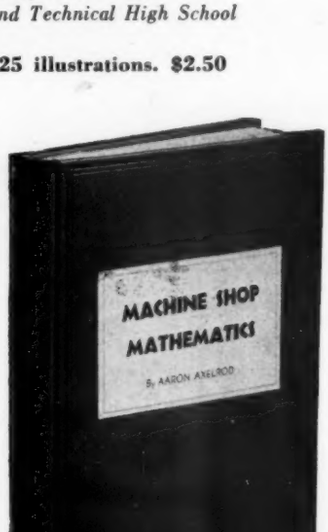

WHETHER it is a simple measurement, or the calculations necessary to set up and operate efficiently a shaper, planer, lathe, or milling machine, the use of a sine bar or selecting the speed for a polishing wheel, the job you have to do today or tomorrow is covered in this book, with the mathematics you need to solve it quickly and accurately. Step by step it takes you through the mathematics you have learned already, or starts you from the beginning if necessary, and goes on through algebra, geometry, and trigonometry, making them all workable tools to help you in machine shop work. Probably you have never seen mathematics presented in such a practical way, as something to help you every day in your work and to prepare you for advancement.

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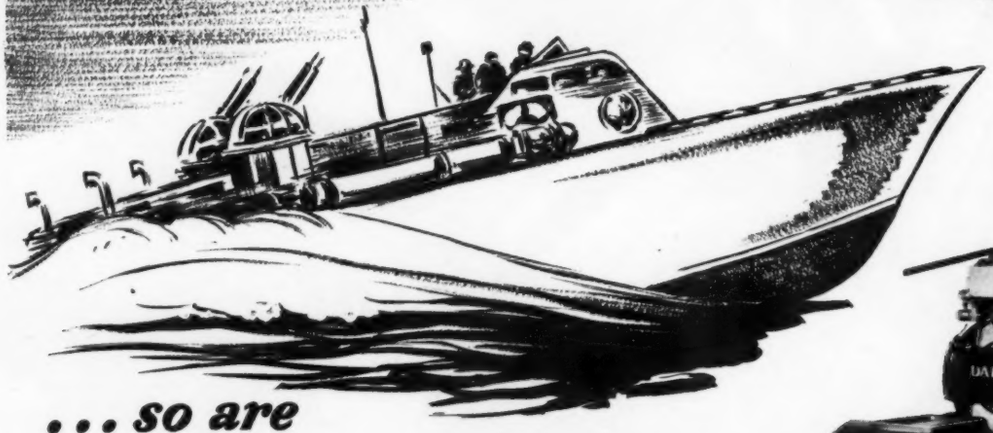

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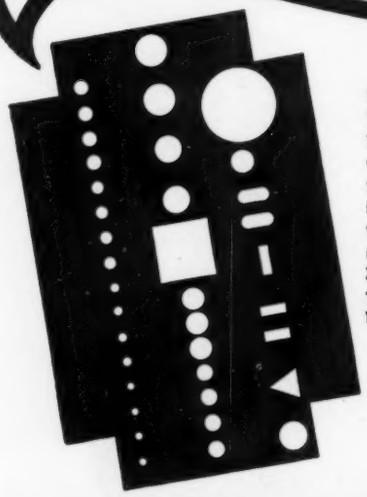

12 gauge (.109) mild steel 18" x 24".

16 different dies used, requiring 16 turret positions

Set up time—5 minutes, 6 seconds

Time to pierce 41 openings including turret rotation—7 minutes, 24 seconds

Time to produce first piece—12 minutes, 30 seconds

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12½ MINUTES—FOR 1st PIECE

7½ MINUTES—EACH FOR 2nd AND 3rd PIECES

The almost unbelievable fact is that this one job—from blank to finished piercing—took just 12½ minutes—the result of the time saving Wiedemann Gauge Table and Turret Punch Press.

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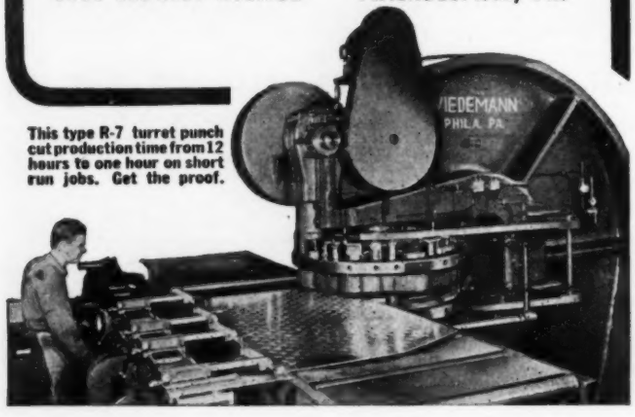
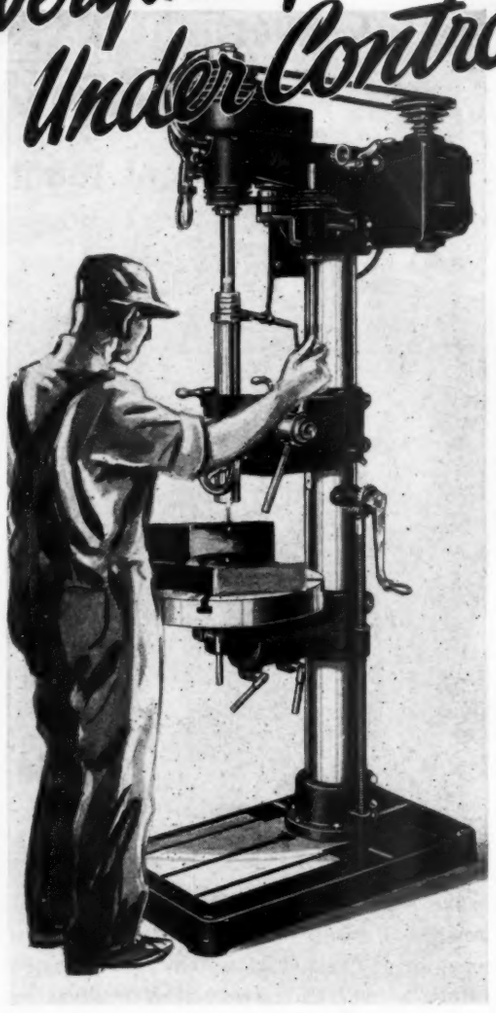


This type R-7 turret punch cut production time from 12 hours to one hour on short run jobs. Get the proof.

Everything Under Control



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Buffalo Drills are designed and built to increase the operator's coordination through intelligent placing of *all* controls for fast and easy manipulation—and for minimum muscular fatigue. Saving in set up time is provided by the simplicity and quick adjustment of sliding heads and tables . . . Throughout every detail of design and construction, Buffalo Drills are efficient team-mates of Industry in today's fast-moving war production.

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Operated at its maximum capacity, this press exerts a pressure of 6000 tons. Its overall height is 55 feet; its beams, with attachments, weigh nearly 1,000,000 lbs.; over 1000 tons of poured concrete were required for its massive foundation. With other press-
er capaci-
ment, it gi
for the ma

What si
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tion of boile
this – it evi
policy which
matic ways
with the lates
and construct
steam generati

Another Southwark Hydraulic Press

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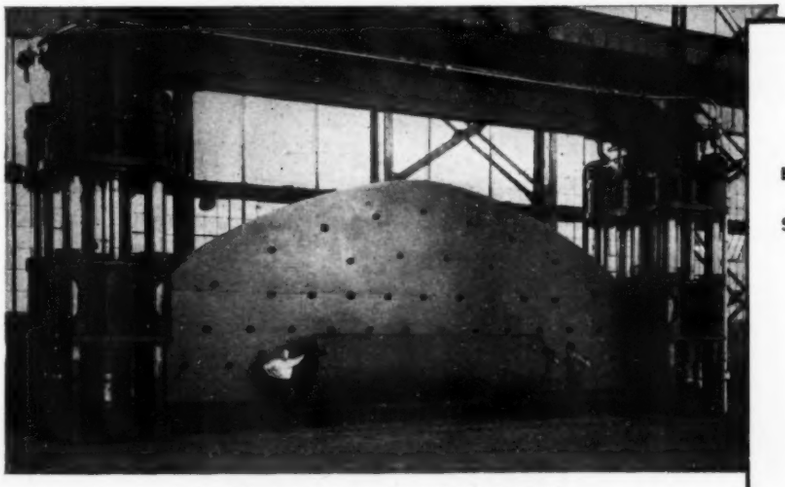
At Right—One of two 3000-ton four-post hydraulic press units showing one of the main rams which are 50" in diameter.



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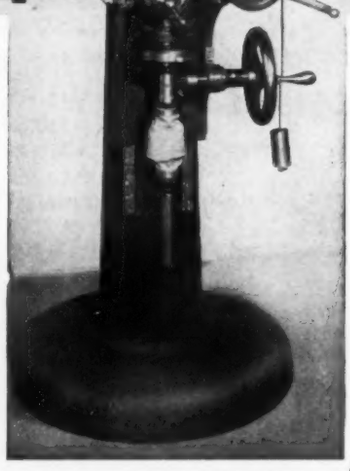

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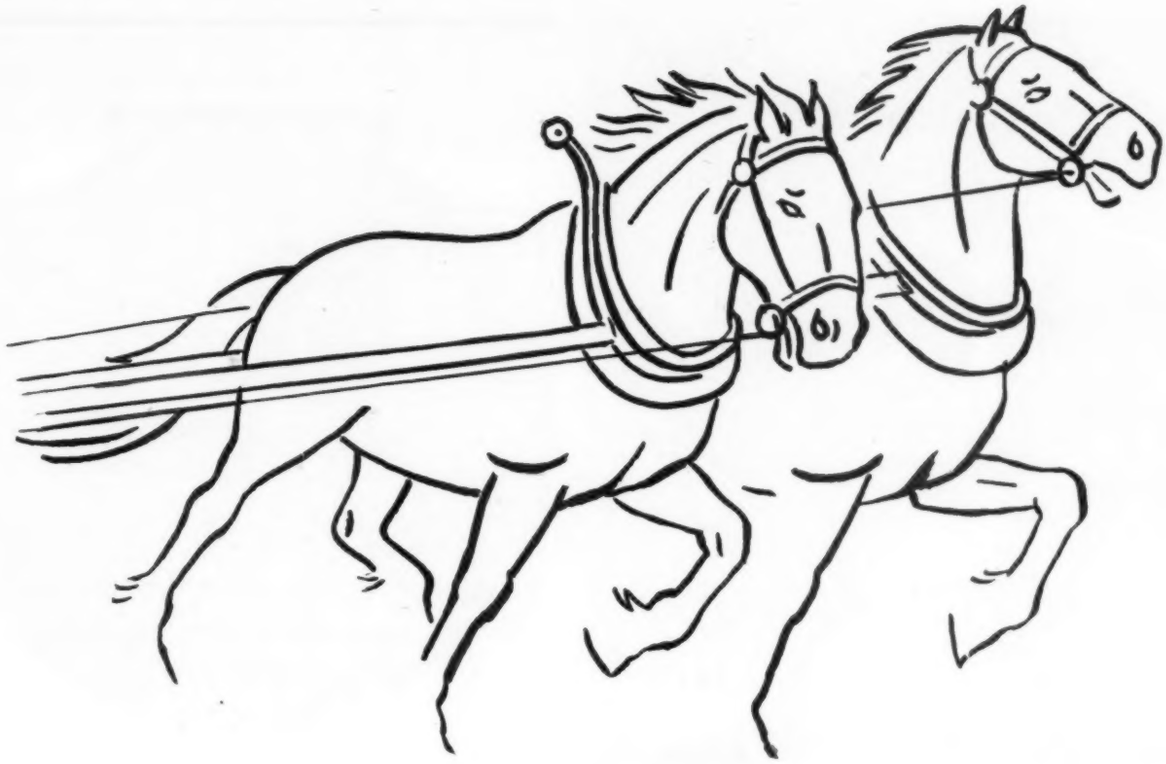

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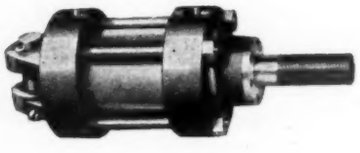

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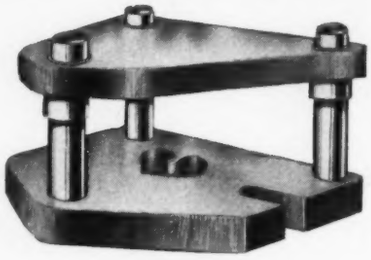

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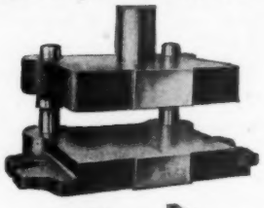

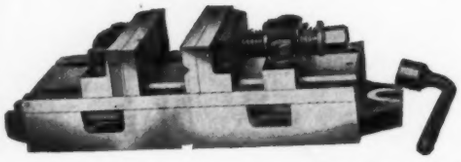

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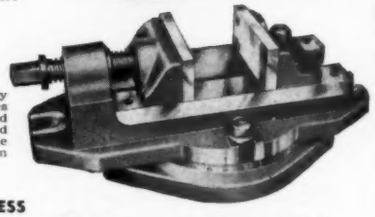

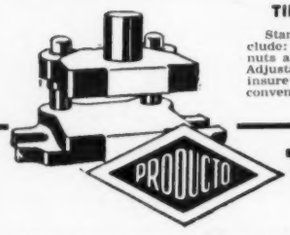

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Advertisements on this and the following page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

KIRK & BLUM

WELDED MACHINE BASES, PEDESTALS and FRAMES
LATHE PANS
GEAR and BELT GUARDS
Pressed Steel Louver Panels and Cover Plates
THE KIRK & BLUM MFG. CO.
2823 Spring Grove Ave., Cincinnati, Ohio

QUALITY

SCREW MACHINE PRODUCTS

• • •

WALTHAM SCREW COMPANY
WALTHAM • MASS.

Need steel balls

for defense assemblies ?

The Abbott Ball Company
1042 New Britain Ave., Hartford, Conn.
ABBOTT BEARING BALLS

We Want War Work
72 yrs. in the business
Large, medium and small
WOOD PATTERNS
NASHUA PATTERN & MODEL CO.
NASHUA, N. H.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them—ask the foundries about our work —they use our patterns every day.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

ADVERTISE HERE
for
PROFITABLE SUB-CONTRACTS
For details, write
CONTRACT WORK DEPT.
American Machinist, 330W.42nd St., N.Y.C.

CONTRACT WORK

Advertisements on this and the preceding page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

SUB-CONTRACT FACILITIES FOR

Non-ferrous hand screw machine products.

Engine and bench lathe, milling and drill press work.

Small sheet metal fabrications to closer than commercial tolerances.

Stampings.

We do our own tooling.

RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication.

SPECIAL ENGINEERING WORK

ON A CONTRACT BASIS . . .
exactly to your specifications . . .

A complete and efficient service for the manufacture of machines and parts, special tools and fixtures, etc., is available to you in our modern, fully-equipped shop. We also offer cam milling facilities that will fit your requirements. You are guaranteed quality work at a reasonable cost.

Send your blueprints or samples today for prompt quotations at no obligation.

Designers and builders of wire and ribbon stock forming machines.

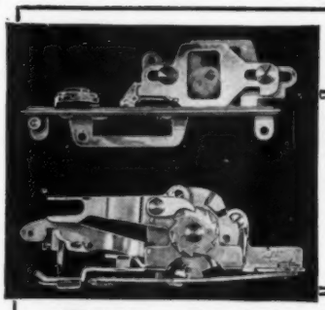
THE A. H. NILSON MACHINE CO., Bridgeport, Conn.

Our Grey Iron Foundry, Structural and Machine Shops are at your disposal

for

Medium Heavy
SPECIAL MACHINERY
CONTRACT WORK SOLICITED

ROBT. HOLMES & BROS., INC.
JUNCTION AVE. DANVILLE, ILL.



STAMPINGS and ASSEMBLIES

We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

"Greater Savings with Greist"

THE GREIST MFG. CO. 546 Blake Street New Haven, Conn.

MACHINISTS AND ENGINEERS
FIDELITY
MACHINE COMPANY
3908-18 Frankford Ave. Phila., Pa.
Jefferson 7600-1-2

METAL STAMPINGS

• TOOLS • DIES •

PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

PUNCHINGS STAMPINGS ASSEMBLIES

Quick action on your problem! Use our manufacturing facilities as your branch factory. Well-equipped for small and medium-sized work. Investigate time-saving possibilities *today!* Send prints or samples.

M & M MANUFACTURING CORP.
FORTVILLE, INDIANA

MACHINE SHOP WANTS DEFENSE WORK

Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.

STEPHEN J. LEWIS ENGINEERING CO.
215 Butler St. Triangle 5-5348 Brooklyn, N. Y.

• DRILLING • TAPPING
• ASSEMBLY WORK
• LIGHT METAL STAMPINGS

Our experience and modern equipment are your guarantee of satisfaction. Send us your blueprints or samples for prompt quotation.

DINSMORE & JAGER
NORTHAMPTON MASS.

DESIGNERS OF
• TOOLS, JIGS, FIXTURES
• SPECIAL MACHINERY
ORDNANCE WORK A SPECIALTY

OLD COLONY ENGINEERING CO.
180 WEEDEN ST. PAWTUCKET, R. I.

NEED SUB-CONTRACTS?

Investigate the possibilities offered you through the CONTRACT WORK SECTION!

For details, write
CONTRACT WORK DEPT.
American Machinist, 330W.42nd St., N.Y.C.

WIRE AND METAL SPECIALTIES
In round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY
Plating and finishing.

EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

DESIGN & BUILD
JIGS, FIXTURES & GAGES

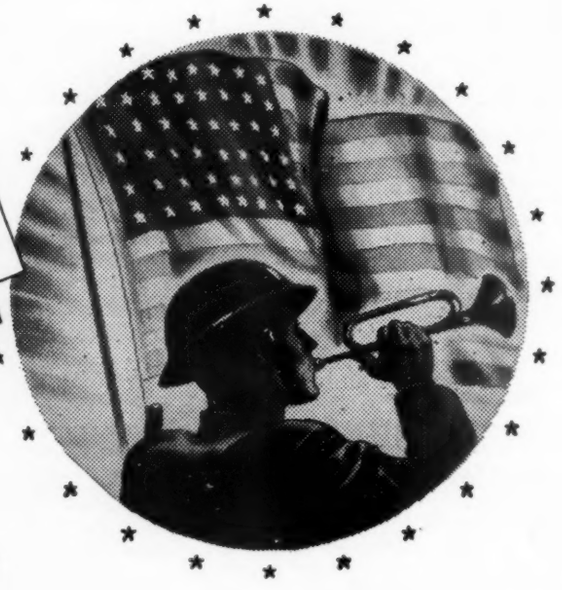
REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

INDUSTRY ANSWERS THE CALL!

A WAR MESSAGE
to
ALL EMPLOYERS
★ From the United States Treasury Department ★
A PAY-ROLL SAVINGS PLAN
WHAT THE PAY-ROLL SAVINGS PLAN DOES
To get full facts on installing the Pay-Roll Savings Plan, write TODAY to Treasury Department, Section B, 709 12th Street, NW., Washington, D. C.
U. S. Defense BONDS ★ STAMPS
This space contributed to National Defense by
YOUR NAME HERE

32,145 Firms With Over 17,700,000 Employees Have Installed the . . .

PAY-ROLL SAVINGS PLAN



Have YOU Started the Pay-Roll Savings Plan in YOUR Company?

Like a strong, healthy wind, the Pay-Roll Savings Plan is sweeping America! Already more than 32,000 firms, large and small, have adopted the Plan, with a total of over seventeen million employees—and the number is swelling hourly.

But time is short!. . **More and more billions are needed, and needed fast, to help buy the guns, tanks, planes, and ships America's fighting forces *must* have. The best and quickest way to raise this money is by giving *every* American wage earner a chance to participate in the regular, systematic purchase of Defense Bonds. The Plan provides the one perfect means of sluicing a part of ALL America's income into the Defense Bond channel regularly every pay-day in an ever-rising flood.**

Do *your* part by installing the Pay-Roll Savings Plan *now*. For truly, in this war, this *people's* war, VICTORY BEGINS AT THE PAY WINDOW.

Plan Easy to Install

Like all efficient systems, the Pay-Roll Savings Plan is amazingly easy to install, whether your employees number three or ten thousand.

For full facts and samples of free literature, send the coupon below—today! Or write, Treasury Department, Section C, 709 Twelfth Street NW., Washington, D. C.

MAIL THIS COUPON NOW

Treasury Department, Section C
709–12th St., NW.
Washington, D. C.

We want to do our part. Please rush full information regarding the Pay-Roll Savings Plan.

NAME .....

POSITION .....

COMPANY NAME .....

ADDRESS .....

NUMBER OF EMPLOYEES .....

MAKE EVERY PAY-DAY . . . BOND DAY!

U. S. Defense BONDS ★ STAMPS

This space is a contribution to NATIONAL DEFENSE by American Machinist

GPO 16—26944-1 Form No. DSS-280

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.

(See ¶ on Box Numbers.)

POSITIONS WANTED (full or part-time salaried employment only), ½ above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

The advertising rate is $6.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A. M., March 23rd will appear in the issue of April 2nd, subject to limitations of space available.

To Employers Who Advertise for Men:

The letters you receive in answer to your advertisements are submitted by each of the applicants with the hope of securing the position offered.

When there are many applicants it frequently happens that the only letters acknowledged are those of promising candidates. Others do not receive the slightest indication that their letters have even been received, much less given any consideration. These men often become discouraged, will not respond to future advertisements and sometimes even question if they are bona fide.

We can guarantee that *Every Advertisement Printed in the Searchlight Section Is Duly Authorized.* Now won't you help keep our readers interested in this advertising by acknowledging every application received, even if you only return the letters of unsuccessful applicants to them marked, say, "Position filled, thank you." If you don't care to reveal your identity, mail them in plain envelopes.

We suggest this in a spirit of helpful co-operation between employers and the men replying to Positions Vacant advertisements.

Departmental Staff

McGRAW-HILL PUBLISHING COMPANY, INC.

"Put Yourself in the Place of the Other Fellow"

SUPERINTENDENT WANTED

Chicago Manufacturer of Brass Fittings and Screw Machine product is looking for a working superintendent with a thorough knowledge of close precision machining of small parts on Browne & Sharpe automatics.
Must have a broad knowledge of 2nd operation machines, brass foundry work able to estimate, make layouts, design cams and tools, and figure costs.
Our products are vital civilian goods, with good priority ratings and some defense work. Therefore, the position is steady.
We have been in business thirty years, with an A-1 rating. Don't answer this ad unless you give a complete history of your experience, former employers, salary earned and your snapshot if possible.

P-212, American Machinist
520 No. Michigan Ave., Chicago, Ill.

WANTED
EXPERIENCED MAN

Qualified to take full charge of a modern Gauge and Cutter plant located near Boston, Mass.

State qualifications in first letter.

P-214, American Machinist
330 W. 42nd St., New York City

PRODUCTION MEN

Large size (rated AAA1) plant manufacturing diversified line of tools and heat treated steel products of national reputation and considerable direct defense work located in eastern part of country has openings for several production men, each to take charge of manufacturing certain standard lines. Men particularly desired have only become available through dislocations caused by war and should be between 30 and 45 years of age, preferably with engineering education and experience in usual shop methods, scheduling and control of production. Applicants must be United States citizens. Positions are permanent to right men. In your reply, which will be held in strict confidence, give all essential qualifications, information, salary expected and how soon available.

P-217, American Machinist
330 West 42nd St., New York City

ASSISTANT SHOP SUPERINTENDENT

Experienced in heavy machine shop parts. Thoroughly familiar with tool design, set-up and production of heavy parts. Vital Navy Work. 100% Defense. Must be U. S. Citizen. A real job for the right man. State qualifications.

P-215, American Machinist
330 W. 42nd St., New York City

OPERATION SHEET WRITER WANTED

Thoroughly capable man to write operation sheets covering misc. bar work and castings, requiring several operations on following type machines, turret lathes, milling and boring, grinders and bullards. Must have had actual shop experience and capable of eventually setting up and running methods dept. Stable company having std. peace time product in addition to defense work. Give complete details—photo—state last salary rec'd.

P-216, American Machinist
330 W. 42nd St., New York City

POSITIONS VACANT

(See also "Selling Opportunities" Offered)

MACHINE DESIGNER: Position open for first-class machine designer of proven ability, experienced in the design of modern machine tools. This position is steady for the right man. Applicants must be citizens of the United States. Location: Rhode Island. P-188, American Machinist, 330 W. 42nd St., New York, N. Y.

PROJECT ENGINEER to fill position relating to experimental development of miscellaneous electrical aircraft accessories. Engineering school or practical experience background. Must have draft deferment and not presently employed in defense industry. Titeflex Metal Hose Co., Newark, N. J.

TOOL DESIGNER AND DRAFTSMAN to fill desirable positions now open for draft deferred men, not employed in defense industries. Titeflex Metal Hose Co., Newark, N. J.

WANTED A MAN with experience to write operation sheets, must understand shop methods in machine operations on Milling, Turning, Hobbing, Grinding, press work, assembly of small machine parts, etc. Location—Connecticut. P-213, American Machinist, 330 W. 42nd St., New York, N. Y.

SUPERINTENDENT for Forge Shop making 105 MM shells. All new equipment. P-219, American Machinist, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 32 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated above, through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If your salary has been $2,500 or more, send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y.

POSITIONS WANTED

AUTOMATIC SCREW MACHINE Foreman. Experience, 17 years—age 40. PW-196, American Machinist, 330 W. 42nd St., New York, N. Y.

INDUSTRIAL ENGINEER, employed, with comprehensive management and production experience, metal products, desires permanent position. University graduate. Married. PW-208, American Machinist, 330 W. 42nd St., New York, N. Y.

PLANT MANAGER Factory Superintendent. Wide Range of Mechanical Productive experience in various manufacturing plants well versed on Production Methods and Tooling for past 20 years in executive positions with A-1 references. Open for position. PW-220, American Machinist, 330 W. 42nd St., New York, N. Y.

MACHINE SHOP SUPERVISOR: Age 44. Twenty-five years experience as machinist, set-up man, foreman, engineer and superintendent. Graduate mechanical engineer with practical knowledge of tooling, speeds and feeds, processing, and production. Experienced in manufacture of guns and tanks. Available March 1st. PW-221, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

(Continued on the following page)

CREATIVE BRAINS AVAILABLE

Mechanical Designer, Consultant, Developer, Successful Inventor and Manufacturer for 20 years. Many inventions including Ordnance, Tanks, and Military Equipment. Authoritative writer on Military subjects and Mechanization. Experience (Shop, Field, Office) Tractor, Airplane, Building, Automotive industries. **PW-213,** 68 Post St., San Francisco, Calif.

SEARCHLIGHT SECTION

POSITIONS WANTED

MASTER MECHANIC or Maintenance Superintendent over 25 years experience in Maintenance and Installations. Good organizer of varied trades gangs. Technical but practical. Would consider out of town. PW-222, American Machinist, 330 W. 42nd St., New York, N. Y.

INDUSTRIAL ENGINEER manufacturing, production control, methods, tooling, fixtures. 20 years experience this country and Europe. Available after April 15th. PW-223, American Machinist, 330 W. 42nd St., New York, N. Y.

I WILL BE open for connection in Metal Working Industry very soon in capacity of Production Superintendent, of plant or equipment Engineering can layout and plan proper Machinery to get maximum production under modern Methods. Am well acquainted with all types of Machine Tools, also well trained on Polishing, Metal Finishing, age 46, married, own home. Address P. O. Box 65, Wethersfield, Conn.

DESIGN ENGINEER or Supervisor with nineteen years experience on small high speed precision machinery desires position where his experience will be of value. PW-224, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

SELLING OPPORTUNITIES

OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITIES OFFERED

WANTED FACTORY REPRESENTATIVE to sell improved machine tool on commission basis. Tietzmann Engineering Co., 1043 Highland Ave., Dayton, Ohio.

CONTRACT WORK

WORK WANTED — For advertisements of work wanted see names indexed under Contract Work in the Searchlight Section Index appearing on the page Facing the inside back cover.

PATENT ATTORNEYS

PATENTS—Booklet free. Highest references. Best results. Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

PATENTS, COPYRIGHTS. Booklet, "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

SPECIAL SERVICE

SPEED UP your engraving in defense production and also cut costs by the process of Photoetching numbers, lettering, trademarks, etc. on all metals in any shape or form. SS-199, American Machinist, 330 W. 42nd St., New York, N. Y.

WANTED

ANYTHING within reason that is wanted in the field served by American Machinist can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

ALFRED HERBERT LTD.
COVENTRY, ENGLAND

OFFICES AND SHOWROOMS AT — LONDON, COVENTRY, GLASGOW, MANCHESTER, BIRMINGHAM, SHEFFIELD, BRISTOL, NEWCASTLE, CALCUTTA, BOMBAY, SYDNEY, MELBOURNE, OSAKA, TOKIO, BUENOS AIRES

representing a number of leading United States makers of machine tools and workshop equipment can undertake additional agencies.

AGENCIES WANTED
for Canada

For machine tools, small tools, sheet metal working equipment, heat treating equipment.

Established organization with sound connections and sales staff.

International Machinery Company
73 Robert St.
Hamilton, Ontario, Canada

CATMUR MACHINE TOOL CORPORATION LTD.

Burwood House, Caxton St. London S.W.1

★ Direct factory representatives in the United Kingdom for leading United States Machine-tool manufacturers.

Started in 1930 our unique policy of pushing American machine-tools exclusively, ensures 100% results.

Being Practical and Technical Engineers, we ensure efficient outputs and service.

Our long years of experience are at your call.

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

PROFESSIONAL SERVICES

Machine Tool Designing Engineers

30 Years Experience in Designing Building & Developing Production Machinery & Processing Operations

Automotive — Tractor
Airplane — Munitions

1115 E. 35 St., Indianapolis, Indiana
W. K. Millholland Machinery Co.

New "SEARCHLIGHT" Advertisements

received by March 23rd appear in the April 2nd issue, subject to space limitations.

Address copy to the Departmental Staff
American Machinist
330 West 42nd St., New York City

LATHES

2—14"x8' American
16"x 8' Lodge & Shipley
26"x10' LeBlond, Universal Crankshaft
42"-54"x24' Putnam

MILLING MACHINES

2" Pratt & Whitney spline (duplex) (Double)
No. 1½B Kearney & Trecker Vert.
No. 1B, 2, 2B. Brown & Sharpe Plain

BORING MILLS

42" Bullard New Era M.D.
51" Bullard, Vertical, 2 Heads
No. 32 Giddings & Lewis Horizontal

TURRET LATHES

Goss & De Leeuw Chucking, 6"x6½"
3¼"x36" Acme flat Turret

GEAR MACHINERY

No. 61 Fellows Gear Shaper, M.D.
No. 4—48" Brown & Sharpe Gear Cutter
Lees Bradner Gear Grinders (2)

MISCELLANEOUS

20 KVA. Taylor Spot Welders
3' Gang Radial Drill
3' American Radial Drill
5' Cinc. Bickford Radial Drill
No. 1 Foote-Burt Duplex Surface Broach
8" Weiland Standard Pipe Machine
No. 4 Hilles & Jones Double End Punch and Shear
2" Acme Bolt Threader
No. 1 Baker Keyseater

WIGGLESWORTH MACHINERY COMPANY
203 Bent St., Cambridge, Mass.

FOR SALE—HOISTS

1—3 drum **HOIST**, Mfd. by Clyde Iron Works, with 200 HP G.E. Slip-ring Motor, Control, and Grids.

1—3 drum **HOIST**, 2 niggerheads. Mfd. by National Hoisting Engine Co., with 125 HP G. E. Variable Speed Motor.

for Better Used Equipment
Write • Wire • Phone
DULIEN STEEL PRODUCTS, Inc.
11611 So. Alameda Tel. Kimball 9151
Los Angeles, Calif.
LOS ANGELES • BUTTE • NEW YORK
PORTLAND • NEW ORLEANS

AUTOMATICS

Cleveland, Model A, ½", ⅝", ⅞", 1¼", 1", 2", 4½" and 5½".

AARON MACHINERY CO.
176 Lafayette St. New York, N. Y.

WANTED

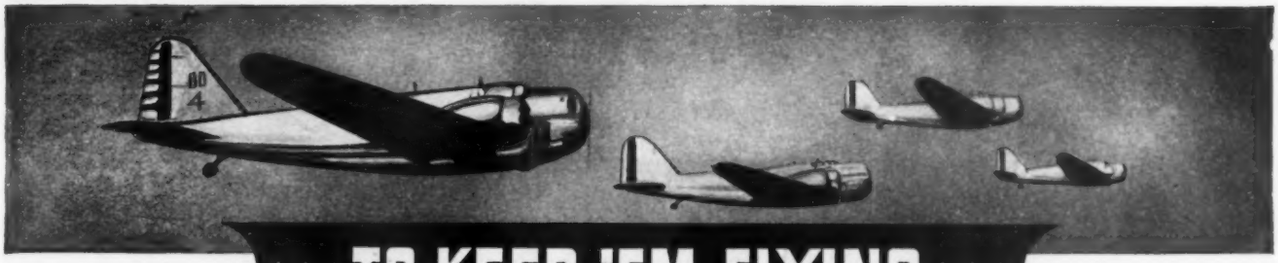
WANTED
SCREW MACHINES

Any Make or Model in Any Condition

MODERN COLLET and MACHINE COMPANY
401 Salliotte St. Ecorse, Mich.

WANTED

PLATE BENDING ROLLS
ANGLE BENDING ROLLS
Any size, width or capacity
Send full details and best resale prices to:
ALEX ZEEVE & COMPANY
2269 Woolworth Building New York, N. Y.



★★★ TO KEEP 'EM FLYING ★★★

KEEP 'EM RUNNING!

Send for this book today!

If you want to know more about this method of increasing machine tool productivity, send today for a copy of the 58-page book, "The Simmons Way."

This is the job the Simmons Machine Tool Corporation performs for those who build the planes, ships, tanks and all of the other weapons with which America shall win this war. *Simmons keeps machine tools running!*

So great is the burden on the American Arsenal that *every* machine tool must run at its utmost productive speed. Therefore, major defense plants are sending their equipment to Simmons, who for thirty years has specialized in restoring machine tools to top-flight condition.

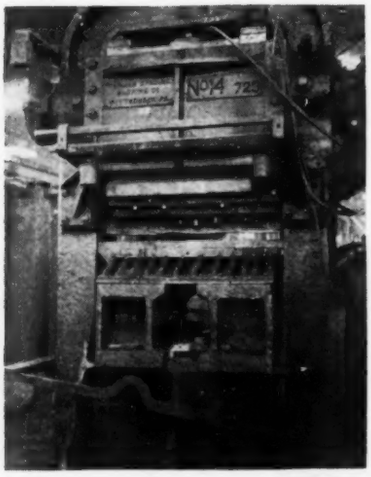
SIMMONS ENGINEERED *Machine Tool* REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 NORTH BROADWAY, ALBANY, NEW YORK
NEW YORK CITY OFFICE: 149 BROADWAY

DEPENDABLE MACHINES

"FALK" REBUILT MACHINERY

WIRE, WRITE OR PHONE



#14—THOMAS SPACING MACHINE

Complete with Tables—Now fitted as Plate Shear.

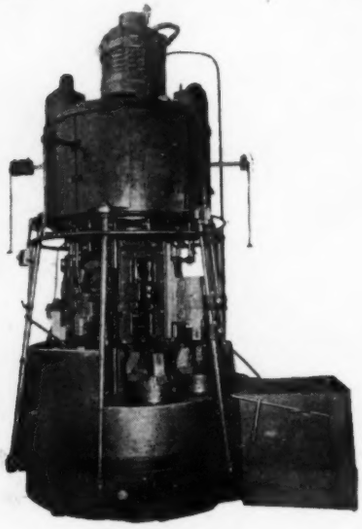
Capacity 42" wide 1¼ thick.

MILLING MACHINES

#3 B. S. Universal Belt Feed.
#1½ Cincinnati Plain
#25 Becker Power feed
#2 B.S. Plain, Belt feed
#½ Van Norman Duplex
#0 Van Norman Duplex
#1—Cleveland Vertical (New)
#40 H Index Vertical (new)
#7 H. BECKER Lincoln (2)
#12—Pratt & Whitney Lincoln (4)
#4 Hendey Lincoln (2)
#13 Brown & Sharpe Prod.
#12—P.W. Duplex Lincoln
#2 Garvin Duplex Lincoln
#2 P. W. Hand Miller (6)
#4—Burke Bench
#1—Cincinnati Plain

14" BULLARD
BULLARD MULT-AU-MATICS

2 14' Bullard Mult-Au-Matic 6 Station, M.D.



SHAPERS

24" Stockbridge
20" Ohio
16" Smith & Mills
17" Smith & Mills
14" Gould & Eberhardt, High Duty
7" Rhodes with vertical head.
26" Niles-Bement-Pond, Motorized.
15" Smith & Mills Single Geared.
12" Gould & Eberhart.

PLANERS

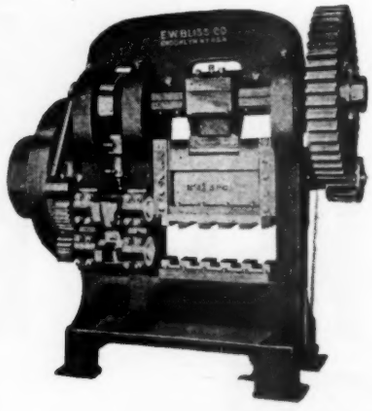
42"x36"x12' Cincinnati, two Heads, belt drive. Rebuilt.
28"x32"x8' Wilson, single head, M.D. Rebuilt
24" NILES-BEMENT-POND Planer-Shaper, Excellent for Die Blocks. Motor Drive.
48"x48"x16' Niles-Bement-Pond 4 Heads Belted Motor Drive.

TURRET LATHES

24" Gisholt, 3⅝" hole
#2A W&S Universal, Chucking
#2A W&S Univ., Bar Feed
2¼x24" J&L
3x36" J&L
#1 W&S, ⅝" collet capacity
#2 W.S. G.F.H. Hollow Hex
#1 W.S. G.F.H. Hollow Hex
#2½ Garvin G.F.H. Tox Turret 1¼ Cap.

PRESSES

No. 18 Bliss, OBI
No. 19 Bliss, OBI, 3
No. 19C Bliss, OBI
No. 20 Bliss, OBI (10)
No. 20B Bliss, OBI
No. 21 Bliss, OBI
No. 21½ Bliss Grd., OBI
No. 75 Toledo Plain
No. 75 Toledo Geared
No. 3 Consolidated
No. 14 Stoll
No. 3 American Can Co., OBI
No. 3 Adriance
No. 37½ Bliss S.S. Plain
No. 5 American, S.S. Tie Rd.
No. 3B Marquette Grd; M.D.
No. 702 Bliss Flat Trimming
No. 4 Bliss, Back Flywheel
No. 50 Perkins Dble. Crank Pl
No. 4 Baxendale (3) OBI
No. 6 Waterbury D.B. II
No. 75½ Bliss Geared; S.S.
No. 24 Adriance Horn Press; 2½" stroke
No. 20 Waterbury Dble. Acting
No. 8-IL Max, Ams Horn—No. 8-16 Verson 350 Ton —8" stroke, all steel.
No. 59 Toledo S.S. Tie-rod 8"
No. 25 Stoll Horn Press
No. 301S Bliss Auto. Gang Press
25-ton Henry & Wright
No. 93D Toledo S.S. Solid Frame Dble. crank; 4" stroke, grd.
No. 166 Consolidated



"BLISS" THREE-COLUMN FORGING PRESS, No. 4 With Positive Clutch Code Word, Realishad

This press as shown, has machine steel upper and lower die holders, and a crank on end of main shaft operates two sector gears attached to rocking die holders for rolling tapers on claw hammers and other similar work. Axes—spring leafs, etc.

Every Item Guaranteed

Partial Listings Only

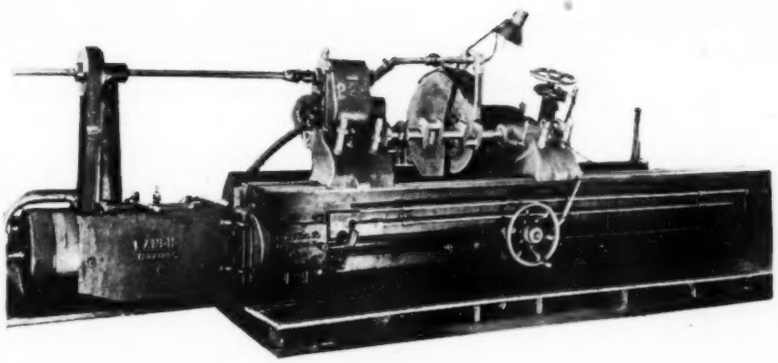
FALK MACHINERY CO

MACHINERY

18 WARD STREET

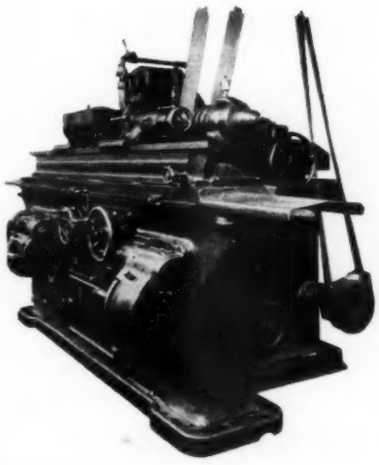
DEPENDABLE GRINDERS

"FALK" REBUILT MACHINERY

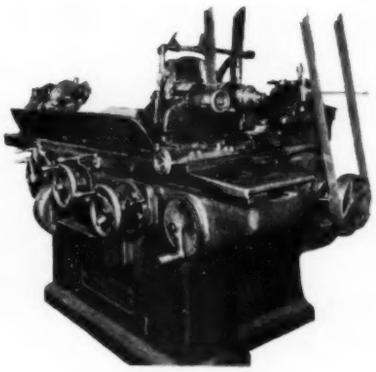


1—2"x120" LANDIS PLAIN GRINDER

Self contained motor drive. Now in operation—ready for immediate delivery.



1—#14 B&S CYLINDRICAL GRINDER —10" x 48" Belt Drive—Very fine condition, ready for immediate delivery.



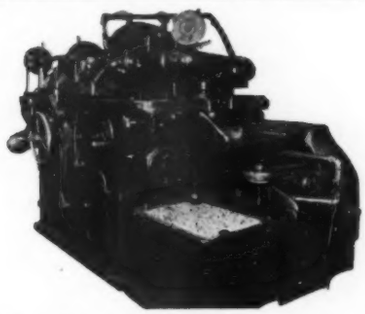
1—#2 CINCINNATI UNIVERSAL CYLINDRICAL GRINDER

12"x36" belt drive complete—very fine mechanical and operating condition. Immediate delivery.

GRINDERS

Landis 20x120 Plain, self-contained
Brown & Sharpe #14, 10"x48", Plain
Landis 10x36, Plain
Cincinnati 12x36 Plain, M.D.
Cincinnati Univ., Belt Drive, #2
Heald #216, 8" Rotary Ring Grinder, with Excello Spindle, Motor Drive.
Covel-Hanchett 40" Vertical Rotary Surface Grinder, Motor Drive.
Gardner #14 Double Opposed Disc. Grinder, BB
Gardner #8 Double End Ring & 40" disc Grinder, with Universal Tables.
Badger 12" Disc Grinder, Ball Bearing, double end, Universal Tables, belt drive.
#1—Iroquois Universal
#2—Norton Universal Tool & Cutter
#1—Le Blond Universal Tool & Cutter

CRANKSHAFT GRINDER
Landis 16"x72", complete with Universal Heads. Belt drive. Ser. No. 3483



10 x 36 Landis Plain Grinder Self contained. Complete with Chuck. Back Rests and Centers.

LATHES

42"x25' PUTNAM Triple Geared, Screw Cutting Engine Lathe; Plain Change; Internal Geared, Face Plate Dr.

25" LeBlond, Heavy Duty, 12' bed
26" Greaves-Klusman, 16' bed
26" Crawford-Erie, 12' bed
22" American, 8' bed
21" Davis, 10' bed
20" Davis, 8' bed
18" Lodge & Shipley, 10' bed
18" Mueller, 8' bed
18" Chard, 8' bed
16" Lodge & Shipley, Grd. Hd., 6' bed
16" American, Grd. Hd. 6' bed
16" Reed, 6' bed
16" Reed-Prentice, 10' bed
17" Sidney, 8' bed
16" Pratt & Whitney, 6' bed
14" Lodge & Shipley, 6' bed
13" Pratt & Whitney, 6' bed
3½x48" Fitchburg Le-swing Lathe

Only ***Send Us Your Inquiries***

RY COMPANY
RY MERCHANTS
EET ROCHESTER, N.Y.

FALK

LOOK! WE MAY HAVE THE TOOL TO SOLVE YOUR PROBLEM

BROACHES

NO. 1 LAPOINTE, screw type.
NO. 2 LAPOINTE, screw type
NO. 2 STANDARD screw type broaching press.
NO. 3 LAPOINTE of HUDSON, screw type
NO. 3 J. N. LAPOINTE double screw type.
NO. 3 AMERICAN high speed, rack type.
NO. 4 LAPOINTE of HUDSON, screw type.
2 ton AMERICAN vertical.

BULLDOZERS

NO. 5 WILLIAMS & WHITE, 12½"x63" crosshead.
NO. 6 WILLIAMS & WHITE.
NO. 29 WILLIAMS & WHITE, 16 x 89½" crosshead.

DIAMOND BORERS

Two spindle COULTER vertical. For single or double spindle operation. Motor in base type.
EX-CELLO-O 9 spindle radial.

PRODUCTION LATHES

9"x14" Porter Cable. 13"x6' Automatic threading.
16"x5' Monarch Mfg.
16"x10' LeBlond Mfg.
18"x7½' Wickes Mfg.
20"x8' Wickes 12 speed geared head Rapid Production.
17"x10' LeBlond geared head with 2 carriages.
34"x11' Wickes center drive crankshaft.
Melling camshaft 4 cyl. motor.
Melling crankshaft 6 cyl. motor.

PRESSES, ARBOR, HYDRAULIC, ETC.

30 ton ATLAS NO. 75, double housing power arbor or forcing.
3 & 12 ton FOX Superflex.
8 20 ton GENERAL FLEXIBLE.
NO. 2 WATSON .STILLMAN hydraulic shaft straightening.
NO. 3¼ GREENERD arbor.

SHAPERS

7" RHODES.
16" WALCOTT.
22" OHIO.
24" ROCKFORD.
36" MORTON draw cut.

ENGINE LATHES

14"x6' Hendey.
14"x6' LeBlond.
14"x8' Monarch.
14"x8' Lodge & Shipley.
18" (20)x8' American, T.A.
18"x8' Monarch.
18"x8' Whitcomb Blaisdell.
19"x8' Sidney.
20" (22")x10' Davis.
24"x10' Reed Prentice.
24"x10' Schumacher & Boye, tapper attachment.
24"x10½' New Haven
24"x12' Lodge & Shipley.
24"x16' Schumacher Boye, taper attachment.
36"—43"x18' New Haven.
36"—47½"x21'6" Wickes.
16"x6' Cincinnati.
16" (18") x8' American.
16"x10' Monarch.
18"x8' Walcott.

TURRET LATHES

No. 2 Wood tilted.
14" swing Warner Swasey.
21"x28" Steinle.
17⅛" swing No. 4 Bardons & Oliver.
2¼"x24" Jones & Lamson.
3"x36" (14½" swing) Jones & Lamson, cross feeding headstock.

GRINDERS, MISCELLANEOUS

5" x 7" PRATT & WHITNEY worm or thread grinder, cam feed type.
HUTTO honing machine, type MD 583.
NO. 6 BRYANT internal.
NO. 50 HEALD hydraulic cylinder.
Type 15 NORTON vertical lapping machines.
NO. 524 MUMMERT DIXON radial or swing frame, 5 or 7½ H.P.
NO. 575 HAWES continuous rod and tube polisher.
10" x 50" NORTON cam shaft grinder.
17" x 36"-48" NORTON, Type B, Model 84 hydraulic cranking grinder.
16" x 4" NORTON style D snagging.
30" x 4" NO. 41 RANSOM double end, motor on spindle.
30"x84" DIAMOND face and edge, motor drive.
14" PRATT & WHITNEY, ball bearing vertical surface.
20" x 12" x 50" Safety Emery Wheel surface
NO. 1 SELLERS lathe & planer tool.
2¾" NO. 5 OLIVER drill.

PRESSES

NO. 21½ BLISS OBI, geared, 2¾" stroke, 6700 lbs.
71 ton WATERBURY FARREL OBI, 4" stroke, 8300 lbs.
NO. 62 BLISS openback non-inclinable, 8" stroke.
NO. 76 TOLEDO, open back non-inclinable, geared, 3" stroke, 7500 lbs.
40 ton No. 6 series A WATERBURY FARREL open-back, non inclinable, 1¾" stroke.
28", NO. 71 SWAINE double crank, 3" crank, 1" stroke.
NO. 4 MASSILLON straight side, geared, 5" stroke, 9650 lbs.
NO. 7 ROCKFORD straight side, geared, 3¾" stroke, 9000 lbs.
NO. 8-7 ZEH & HAHNEMANN straight side, geared, 2¾" stroke, 6000 lbs.
NO. 53 TOLEDO straight side, 3" stroke, 3300 lbs.
NO. 55½ TOLEDO straight side, 5" stroke, 7425 lbs.
750 ton BALDWIN SOUTHARK triple action hydraulic operated toggle drawing press. Between uprights 11'-10½", shut height 84", strokes 37", 26" and 12". Weight 500,000 lbs.
NO. 796¼D TOLEDO 108" double crank, toggle drawing, 201,000 lbs.
NO. 180 TOLEDO, 60" x 60" single crank, double geared toggle drawing, 12"-13" crank, approx. weight 189,500 lbs.
NO. P2 FERRAUCUTE, punching, 1" stroke, 2500 lbs.
NO. 2 STANDARD MACHINERY CO., screw press, 12" stroke, 5200 lbs.

DRILLS, RADIAL

All have single pulley or motor drive and tapping attachment unless otherwise noted
3' CINCINNATI, Old style without gear box but in good working order.
4' MUELLER.
6' DRESES, full universal.

GRINDER, CYLINDRICAL, PLAIN AND UNIVERSAL

6" x 32" NORTON.
10" x 24" LANDIS.
10" x 36" CINCINNATI UNIVERSAL.
10" x 36" NORTON.
10" x 50" NORTON.
12" x 36" LANDIS self contained.

Many other good tools; phone, wire or write, giving details of your job.

MILES MACHINERY CO. - - - Saginaw, Mich.

HIGH GRADE MACHINE TOOLS

LATHES

14"x6' Hendey Grd. Hd. S.P.D. T.A.
16"x8' South Bend Cone Drive, Q.C.
20"x8' American High Duty Cone, Q.C.
18"x8' LeBlond Cone, B.G.
18"x8' Greaves Klusman Grd. Hd. T.A. Q.C.
20"x17' Greaves Klusman Grd. Hd. T.A. Q.C.
20"x8' American Grd. Hd. M.D.
25"x16' LeBlond H.D. 3 S.C.D. D.B.G.
36"x20' Fifield Engine Lathe, Cone Drive.

GRINDERS

#55 Heald Internal Grinder, Belt driven.
12" Pratt & Whitney Surface Grinder, B.D.
14"x72" Queen City Self Contained Plain.
60"x60"x12' Pond H.D. 4 hds.
#5 Oliver Drill Grinder, Motor Driven.

GEAR CUTTERS

#3-26" B & S Gear Cutter.
#1 and 3 Adams Gear Hobbers.

BORING MILLS

42" Niles Bement Pond, H.D.

BOLT & PIPE THREADERS

2" Landis with Lead Screw Cone drive.
3" Landis Cone drive.
1" Acme Cone drive.
2" Landis Pipe Machine Cone drive.
2" Acme Cone drive.

RADIAL & UPRIGHT DRILLS

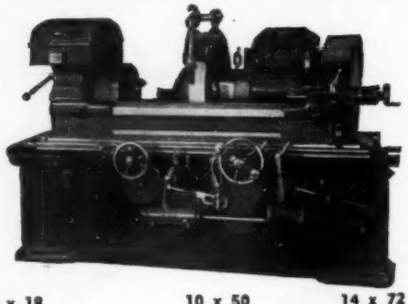
4'x6' Bickford Plain S.P.D.
20" Barnes 4 spindle drill.
36" Barnes All geared Tapping attachment.

SHAPERS & PLANERS

24" Rockford H.D. Back Geared Crank.
24" Steptoe H.D. Back Geared Crank.

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St. Cincinnati, Ohio

HILL-CLARKE
MOTOR DRIVEN GRINDERS



SIZES

10 x 18	10 x 50	14 x 72
10 x 24	10 x 72	14 x 96
10-15 GAP x 24	14 x 36	16 x 50
10 x 36	14 x 50	16 x 72
		18 x 96

HILL-CLARKE MACHINERY CO.
651 WASHINGTON BLVD. CHICAGO

5—Watson-Stillman 200-ton Semi-Automatic Molding Presses.
1—Watson-Stillman Hydro-Pneumatic Accumulator for above Presses.
1—Watson-Stillman Horizontal Pump for above, M.D.

D. E. DONY MACHINERY CO.
New and Used Machine Tools
47 Laurelton Road Rochester, N. Y.

1—No. 2B Hendey Universal Mill, M.D.
1—No. 4 Brown & Sharpe Plain Mill, M.D.
1—No. 4 Becker Vertical Milling Machine
3—9" Porter Cable Mfg. Lathes, M.D.
1—No. 3 Toledo Back-Geared Press, M.D.
1—No. 3 American Broaching Machine
1—18" Libbey Turret Lathe
1—No. 17 Barber-Colman Gear Hobber
2—15" Gleason Pinion Roughers
11—1" Landis Threader
1—No. 12 Natco 16 Spindle Drill

Your inquiries receive prompt attention

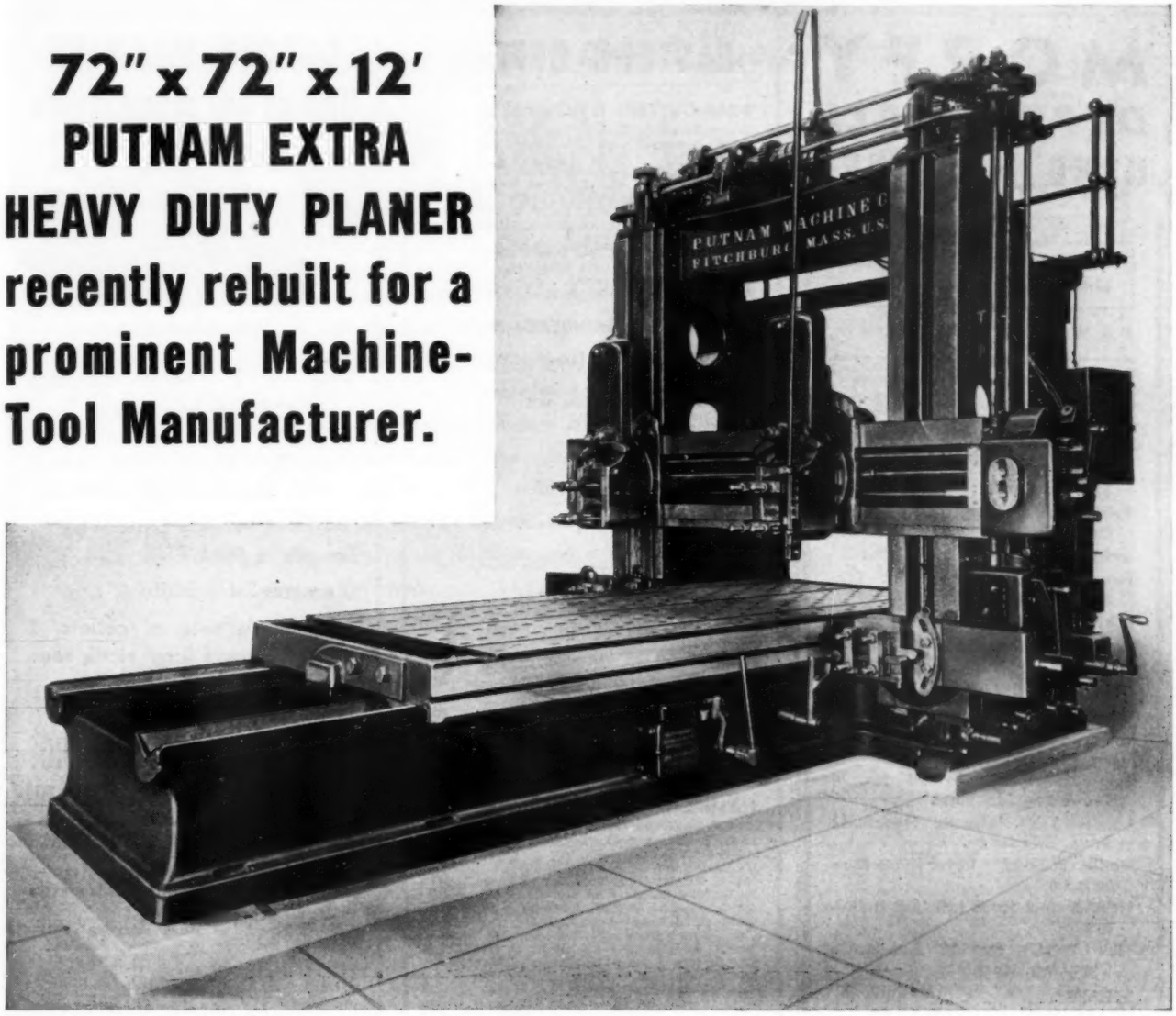
CENTRAL MACHINE TOOL CORPORATION
122-126 Nebraska Ave. Toledo, Ohio
Adams 1914

OTT MACHINERY SPECIALS

AUTOMATICS, B. & S. #00 Cutoff
AUTOMATICS, Cleveland ⅞—1 1/16" Model M
AUTOMATICS, Cleveland, ⅝—⅞ & ⅞—1¼" Model A
AUTOMATICS, Gridley, 2¼ & 3¼" S.S.
BORING MILLS, Bullard, 42" 2 Swivel Heads
GRINDERS, B. & S. #16 Plain
GRINDERS, Norton, 10x24 & 36" Plain
LAPPER, Norton #10U & 15 Vertical, M.D.
MILLING MACHINES, Becker Vertical, #4B.
PLANERS, 30x30x8' Ctl-44x44x18' Niles
PRESSES, Toledo, #34 & 35 Solid Back, S.G.
PRESSES, Ferracute, P2, 3 & 4, Solid Back
ROLLS, Bertsch 6'x¾" M.D.
SHEARS, Robinson ,8'x14 gauge, M.D.

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

72" x 72" x 12' PUTNAM EXTRA HEAVY DUTY PLANER recently rebuilt for a prominent Machine-Tool Manufacturer.



Following Machines in stock. Can be rebuilt and motorized to suit your requirements:

PLANERS

1—36"x36"x16' Niles 4-heads, MD
1—42"x42"x12' Cincinnati 2-heads, MD
1—47"x40"x12' Gray 2-heads, MD
1—72" Morton Draw Cut Portable, MD

BORING MILLS

1—48" Niles Wheel Borer, MD
1—7" & 5" Dbl. Spindle Cyl. Borer, MD

MILLERS

1—9" Spindle Ingersoll Horiz. Facing Mill
1—37"x37"x14' Ingersoll Adj. Rail Slab
1—#2V Potter & Johnson Vertical
3—28" Cincinnati Semi-Automatics
3—24" Cincinnati Automatic Facing Millers Hydraulic Feed
1—24" Cinc. Duplex Miller
1—P.&H. Vertical Keyway Miller

GRINDERS

1—20"x96" Landis Cyl. Motor Drive
1—24"x96" Landis Cyl. Motor Drive
1—30"x240" Landis Cyl. Motor Drive

GEAR CUTTERS

1—36" G&E Auto. Gear Cutter
1—60" G&E Auto. Gear Cutter
1—72" G&E Auto. Gear Cutter
2—Barber-Colman Single Overarm Hobbers

NEW MACHINES available for immediate delivery!

SURFACE GRINDERS	HAND MILLERS	12" SLOTTERS
Precision Type—6"x12"x18" capacity	Heavy Duty—High Speed	Dual Control—Motor in Base

ATLANTIC MACHINERY CORPORATION

149 BROADWAY Telephone WOrth 2-0662 NEW YORK

MOREY
DEPENDABLE
USED MACHINES

Rockford #2 Horiz. Boring Mill—floor type—M.D.

P & W 6"x132" Thread Miller

Ingersoll 44"x36"x8' Planer Miller—2 Heads on Adj. Rail —P.R.T.—M.D.

McCabe 24"—42"x14' Double Spindle Lathe
Bridgeford 36"x40', 15 speed Geared Lathe
Sellers 42" Car Wheel Lathe
Foster No. 1F Fastermatic Turret Lathe
NATCO No. 12 Multi-Spindle Drill
Sipp 3 spindle High Speed Drill
B. & S. #4—48" Gear Cutter
Gleason 24" Bevel Gear Planer
Gleason 37" Bevel Gear Planer
Gleason 6"-11"-18" Bevel Gear Generators
La Pointe No. 2 and No. 4 Broaching Machines
Landis 3½" Internal Hydraulic Race Grinder
Heald #22-12" Rotary Surface Grinder
HEALD Nos. 60-65 Internal Grinders
New Britain No. 22 Automatic Chucking Machine
Cleveland ⅜"-½" Model "B" Automatic Screw Machine
Espen Lucas No. 138 Cold Saw—Cap. 12" Rd.
Newton No. 200 Cold Saw—Cap. 11" rd.
Cochrane & Bly No. 5 and No. 6 Cold Saws
Cleveland No. 1 Plate Planer—21' capacity
Frew Single Spindle Profiler

Cincinnati 44"x44"x15' Planer —2 rail heads, 1 side head—M.D.

Acme 1" All Steel Upsetter
Ajax 3" All Steel Upsetter
Saunders 8"-18" Pipe Threader, M.D.

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your Specific Inquiries

MOREY
MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

EASTERN OFFERS

GEAR CUTTERS & HOBBERS
Gleason Spiral Bevel Gear Rougher, s.p.d.
6", 18" Gleason Straight Tooth Bevel Gear Generators
16" Gould & Eberhardt Gear Cutter
No. 1 Whiton 26" Full Universal Spur & Bevel Gear Cutter
No. 3—26", 3 Heavy, 3—36", 4—36", 4—48", 6—60", 6—72" Brown & Sharpe Automatic Spur Gear Cutters
No. 3—26" Cincinnati Spur Gear Cutters
No. 5A Lees-Bradner Gear Generator, 14" size
Cross Gear Tooth Rounder
20" Rochester Gear Tooth Rounder

CYLINDRICAL GRINDERS—Plain
6x32" Norton, m.d.
10x18" No. 14 Brown & Sharpe
10x24" Landis, m.d.
10x30" Queen City, m.d.
10x36" Landis Integral Cam, m.d.
10x36" Norton, m.d. (5)
10x50" Norton, m.d.
10x52" Landis, m.d.
10x72" Norton, m.d.
12x36" Cincinnati, m.d.
12x36" Modern, m.d.
12x42" Landis, belt
12x48" Modern, m.d.
12x72" Cincinnati, 3 m.d., hydraulic
14x50" Norton, m.d.
16x52" Landis, m.d.
18x72" Cincinnati Automotive Parts, m.d.

UNIVERSAL CYLINDRICAL GRINDERS
No. 3—12x42" Landis
No. 3, 4 Brown & Sharpe

SURFACE GRINDERS
No. 1 Warren F. Fraser Co. Lapper, belt
18x48" Diamond L.D. Face, m.d.
30x84" Diamond H. D. Face, m.d.
54" Bridgeport Knife, belt
No. 500 UK Covell-Hanchett Knife, m.d., cap. 8'6"

HAMMERS
60 lb. Bradley Rubber Cushioned Helves, belt
80 lb. Bradley Rubber Cushioned Helve, belt
100 lb. Little Giant, belt
200 lb. Bradley Upright Strap, belt
350 lb. Bement-Miles Single Frame Steam
350 lb. Niles-Bement-Pond Steam, new (3 in stock)
650 lb. American Eng. Works Steam
800 lb. Niles-Bement-Pond Steam
1100 lb. Niles-Bement-Pond Steam (7 in stock)
2000 lb. Erie Double Frame Steam Forging
2000 lb. Niles-Bement-Pond Single Frame Steam
2500 lb. Bement-Miles Steam
Pettengeil Bumping Hammer, belt

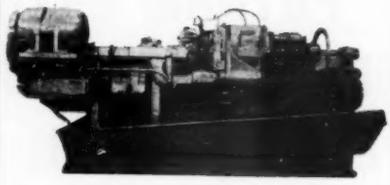
MANUFACTURING LATHES
3x80" Lo Swing, s.p.d.
8x36" Lo Swing, s.p.d.
11"x4' Wells Speed Lathe
12"x5' Sebastion Turning Lathe
12"x5' Wood Lathe
15"x6' Automatic Threading Lathe
16"x6' Rockford
18"x8' Chard
20"x8' American Turret
28"x10' American Plain Turning
30" Streit Pulley Turning
Niles-Bement-Pond Axle Lathe
No. 5 Niles-Bement-Pond Center Driving Car Wheel Lathe, size 42x96", m.d., new
Niles-Bement-Pond Quartering Machine, m.d.

MILLING MACHINES
No. 25 Bilton Plain, cone
No. 2 Garvin Lincoln Type, cone
Gooley & Edlund Briggs Type
Putnam Briggs Type
24" Cincinnati Automatic Duplex
40" Ohio Tilted Rotary, m.d.
C66A Newton 3 spindle Continuous, m.d.
C17 Newton Vertical Slab Miller

Partial Listing only.
Send us your inquiries.

The
EASTERN
MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

CUTOFF MACHINE
One of our many items



Actual Photograph

1⅝" x 7" New Britain Cutoff Machine

Capacity of chucks: round 1⅝", square 1.149", hexagon 1.407".

Length of feed 7".

Diameter of spindle 3".

With extra sets of collets, 2 stock stands, and stock reel.

Weight about 10,400 lbs.

LOUIS E. EMERMAN & CO.
1761 Elston Ave. Chicago, Ill.

IN STOCK
2¼, 3¼ and 4¼ Gridley automatics
24 x 48 J. J. McCabe
42" Bullard vertical boring mill, M. D.
44" Rogers vertical boring mill
Cincinnati Duplex Miller
16" x 10' Hendey M. D. lathe
16" x 54" Norton grinder
16" x 66" Landis universal grinder
2—3¼" Greenlee Turret Lathe Bar & Chucking

Carry a large & selective stock of machinery. Kindly send your inquiries

S. & S. MACHINERY CO.
207 Centre St. WOrth 4-5710 N. Y., N. Y.

#6 BROWN & SHARPE
72" SPUR GEAR CUTTER
Immediate delivery.
ADELPHIA EQUIPMENT CO.
341 No. 3rd. St. Phila., Penna.

FOR SALE
1—36" x 18' Putnam 18 sp. oil grd. Head Lathe
#3 Cincinnati HP plain Miller Cone.
1—12" x 96" Landis Grinder, Self-Cont.
E.G. 52 Ferracute Coin Press 150T
#33 Brown & Sharpe Automatic Miller.
D25 Fox 16 sp. drill, 42" rot. table, tapp.
3—#3 & 1 #4 B & S Univ. grind., 3 M.D. New 1940
1—42" Colburn Vert. Boring Mill
#22 U. S. Wire former, grd. & flat stock
T. R. WIGGLESWORTH & CO., MACHINERY
5122 St. Clair Avenue Cleveland, Ohio

POWER PRESSES
BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

St. Louis Headquarters for Good Used Tools . . .

PRODUCTION MEN:

Make it a point to look over our very large and diversified stock while you are in St. Louis

Whether you are a customer of ours or not, and are planning to attend the A. S. T. E. Convention, we invite you to visit our display warehouse. We have been established in St. Louis close to 50 years and have had the pleasure of doing business with many of you and your organizations from coast to coast. The convention offers a splendid opportunity for you to see our stock in five warehouses. We believe it will be an interesting visit for you and may be of benefit in your planning for the future. Just give any of we McDonalds a phone call and we will gladly send for you.

BORING MILLS
Bullard 28" Vertical One Swivel Head on rail.
Bullard 51" Vertical Two Swivel Heads on rail.
Bausch 44" Vert. M.D. Two Swivel Head on rail.
Colburn 30" C.D. Vertical Turret Lathe.

DRILL PRESSES
Morris 3' Single Pulley Gear Box Radial
Mueller 4½' T & L Pulley Gear Box Radial
Bickford 6' Gear Box Radial Drill.
Defiance 2" Cap. S.P.D. Heavy Duty Upright.
Baker No. 217 Grd. Feeds Heavy Duty Upright.
Barnes 24" Four Spindle All Grd. Camel Back.

GEAR MACHINES
Brown & Sharpe 26" x 8" Cap. Auto. Spur Gear Cutter
Gould & Eberhardt 48" x 10" Auto. Spur Gear Cutter.
Cincinnati 36" x 12" Cap. Auto.Spur Gear Cutter
Fellows No. 3 Automatic Gear Shaper

GRINDERS
Landis 10" x 30" Plain External.
Brown & Sharpe 10" x 48" Plain External.
Cincinnati 12" x 36" Plain External.
Besly 30" Double End Disc.
Pratt & Whitney 12" Wheel Vert. Auto. Surface.
Diamond No. 1 Hvy. Auto. Horizontal Surface.

LATHES SCREW CUTTING ENGINE
Hendey 16" x 8' Q.C.G. Motor Driven
Monarch 16" x 8' Q.C.G. with Taper Attach.
Sidney 18" x 8' Q.C.G.
Schumacher Boye Emmes 20" x 10' Q.C.G.
American 34" x 17½' Q.C.G. Motor Dr. Taper

MILLING MACHINES
Cincinnati No. 1-M S.P.D. Geared Head Plain
Brown & Sharpe No. 3 C.D. Plain Horiz.
LeBlond No. 3-H Hvy. C.D. Plain Horiz.
Newton Single Sp. Hvy. Vertical 48" Rotary Table.
Ingersoll Hvy. Two Spindle Vertical.

PLANERS
Gray 24" x 24" x 6' Table One Head.
Pond 34" x 32" x 10' Table Two Heads.
Cincinnati 36" x 36" x 12' Table Two Heads.

SHAPER
1—Gould & Eberhardt 24" Single Pulley Gear Box.

McDONALD MACHINERY CO.

1531 N. BROADWAY ST. LOUIS, MO.

IN STOCK NOW!

DRILL PRESSES
No. 2-B Edlund 6 spindle; 4 spindle Foot Burt; 3 spindle Henry & Wright, 24" Barnes Camel Back; 8 spindle Multiple Rail.
SINGLE SPINDLE: 25" Weigel 34" Barnes, 26" Rockford; 24" Sibley.

RADIAL DRILLS
6' FOSDICK; 6' Western; 3' American; 4' Hammond Jacknife; 2½" Morris.

GRINDERS
CYLINDRICAL: No. 12 Brown & Sharpe; 12x42" Landis; 10x24" Norton.
DISC: No. 24 Gardner, Ball Bearing, 52".
SURFACE: Springfield Planer Type; No. 3 W&M. 15"x15"x8' Norton; No. 2 Dia.; No. 5 Abrasive.

LATHES—FLOOR
30' Pit, 156" face plate; 52"x22' Fifield.
38"x28' Bridgeford Geared Head, Swing 62" with raising blocks; 36"x30' New Haven.
36"x16' & 32"x16' Bridgeford.
24"x14' American; 24"x15' New Haven.
20"x20' Monarch, G. H.; 20"x12' Wolcott.
18"x10' Lodge & Shipley & American.
18"x7' and 16"x6' Hendey Yoke Head.
15"x8' Sebastian, G.H.; 14"x8' Hendey.

PLANERS
36"x36"x14' Detrick Harvey Openside.
36"x36"x8' Niles; 36"x36"x10' American.
26"x8' Cleveland Openside; 20' Niles Plate.

SAWS
COLD: No. 666 Cochran Bly, M.D.
FRICTION: Nos. 0, 1, 2, 3, 4 Ryerson.
HACK: 6x6 & 9x9 Racine; 6x6 Peerless.

SHAPERS
28" G&E Hi-Duty B.G.; 25" Smith & Mills.
24" Queen City; 16" Steptoe, 12" Niles.

SPECIAL OFFERING

LARGE PRESSES
CLEARING CRANKLESS TRIPLE ACTION. 4 point suspension type; Bed 84" x 133" M.D.; All steel construction; Self-contained, gears enclosed, running in oil
NO. 97-H TOLEDO: Double geared; Tie rod construction; 10" stroke; Max. pressure approx. 650 tons.
NO. 409 BLISS: 108" bet. housings; bed 60 x 108"; Tie Rod; Air cushions; Stroke of plunger 31"; Est. wght. 215,000 lbs.

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No. 3 Acme Universal Turret Lathe. Grd Head. Arranged for Chucking.
21" Model H Gisholt Turret Lathe.
14 ga x 8' OHL power Squaring Shear.
4 & 6 Spindle Avery Sensitive Drills No. 2 M.T., B.B.
No. 1B, No. 2B Edlund, 2 Spindle Sensitive Drills
16"x60" Landis Universal Grinder. Overhead belt drive
24"x24" Ohio Planer, 1 head, belted moto. drive.
18"x9' Chard Lathe semi quick change cone.
10' Robinson Toggle Type Press Brake
No. 12, 13 Natco Drills

IROQUOIS MACHINERY CO.

662 Ohio St. Buffalo, N. Y.

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Large stock of Fillister Head Cap Screws
7/16 to ¾ diameter ½ to 4-½ long.
60% DISCOUNT
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COINING PRESS
Toledo #669
2000 Ton Capacity
Write To
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NEW HAVEN, CONN.

UNUSUAL VALUES

Shapers: 24" G&E.
28"x20'6" **Rahn-Carpenter Lathe** 14' between centers
24"x16' **Greaves & Klusman**
Briggs Type A Milling Machine
Presses: #48 Niagara, #16 J. M. Robinson ⅞" capacity Rock River punch and shear
Broaching Machines, LaPointe, #1, #3
Drill Presses: 28", 24" Hoefer; 25", 20", 40" Bement
Ceiling Suspended Drill
2 50# **Bradley upright hammers,** m.d. like new
Radial Drills: 5' Bausch
Miller: 20"x24"x18" Ingersoll
Grinders: #20 Bryant Internal
300 other machinery items
MOTORS—new 5 H.P. for 3-phase, ball brg. $55.75

Other sizes equally low priced. Also rebuilt motors.

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COLUMBUS, OHIO

20" X 144' LANDIS Plain Cylindrical Grinder

WITH 24" DIA. WHEEL, 5 STEADY RESTS, MOTORIZED

32" X 20' LEBLOND Lathe, Quick Change, Motorized

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2—24" Steinle Turret Lathes
1—3B Foster Turret Lathe
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1—28" x 10' New Haven Engine Lathe
1—17" x 6' LeBlond Engine Lathe
1—17" x 8' LeBlond Production Lathe
4—25" x 12' LeBlond Hvy. Duty GH Prod. Lathes
2—25" x 14' LeBlond Hvy. Duty GH Prod. Lathes
1—14" x 6' Reed Prentice Geared Head Lathe
1—14" x 19" Fay Automatic Lathe
1—36" Cincinnati Horizontal Borer
1—3¾" Barrett Horizontal Boring Mill
1—Harnischfeger Horiz. Drill & Borer
1—4" Niles Horizontal Boring Mill
1—24"x 24" x 6' Ingersoll Slab Mill
1—2½' Dreses Radial Drill
1—2½' American Radial Drill
1—5' Niles Radial Drill
1—D2 Colburn Drill
1—5A Lees Bradner Gear Hobber
1—No. 12 Barber Colman Hobber
1—20" Rockford Shaper
2—No. 65 Heald Grinders
1—No. 14 Brown & Sharpe Grinder
1—Greenfield Cutter Grinder
1—4" Ajax Upsetter (new 1929).
1—No. 0 Ajax Forging Roll
2—Ajax 1" Headers
1—48" x 48"x16' Pond Planer; motor drive
1—100,000-lb. Riehle Testing Machine
2—275 Ton Hydraulic Presses, 4 post type
1—4½" Model H Gridley Chucking Machine
1—2A High Speed Hammer
1—3-Spindle Gleason Rougher
1—2½' Mueller Radial Drill
1—1F Norton Lapper.
1—3½L La Pointe Hyd. Broach (Brand new).
1—36" Fellows Gear Shaper.
1—No. 4H Millholland Turret Lathe.
8—No. 4 Warner & Swasey Plain.
1—No. 6 Warner & Swasey Plain.
4—1"x5" New Britain 6 sp. Auto.
4—1"x5" New Britain 6 sp. Chuckers.
1—No. 454 New Britain 4 sp. Chucker.
1—No. 652 New Britain 6 sp. Chucker.
1—No. 2G Brown & Sharpe Auto.
1—No. 00 Brown & Sharpe High Speed.
1—No. 2 Brown & Sharpe Auto.
1—No. 0 Brown & Sharpe Auto.
1—No. 2 Avey H.S. Drill.
1—No. 2BG Garvin Tapper.
1—No. 84 Gardner B.B. Opposed Disc Grinder.
1—5½B High Speed Hammer.
1—2½' Fosdick Radial Drill.
3—18" Gleason Gear Generators.
1—No. 14 Cochrane & Bly Duplex Mill.
1—20" Steptoe Shaper; Timken Bearing.
1—Hendey Duplex Centering.

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1—3½" Ajax Upsetter
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20 POWER SQUARE SHEARS ARRANGED FOR MOTOR DRIVE
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5/16" to 4¼" | ⅜" to 3½"

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4AC **LeBlond** Crankshaft Lathe
14x6 **American** Grd. Head Lathe M.D.
16x6 **Lodge & Shipley** Grd. Head Lathe
27"x19 Ft. **Lehman** q.c.g. Lathe
16x8 Bradford Geared Head M.D. Lathe
16x48 **Landis** Crankshaft Grinders, self-contained.
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5x18 **Ott** Grinder
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#AB-2 **Becker** Vertical Miller
#1 **Smalley** General Thread Miller.
#3 & 12 **Barber-Colman** Gear Hobbers
#00 **Pfauter** Gear Hobbers
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16" to 28" **Gould & Eberhardt** Shapers S.P.D.
11" **Gleason** Gear Generators
2—#2 **Foster** Screw Machines

VICTOR MACHINERY CO.
135 So. Clinton St. CHICAGO, ILL.

Automatic Screw Machines

½" CLEVELAND, 1 Spdl., Automatic Screw Machine—Model A.
2" CLEVELAND, 1 Spdl., Automatic Screw Machine—Model A.
½" CLEVELAND, 5 Spdl. Automatic Screw Machine, M.D.
No. 00 B. & S. Automatic Screw Machine.
No. 515 ACME, 4 Spdl., M.D., ⅝".
No. 52 ACME, 4 Spdl., M.D., ¾".
No. 53 ACME, 4 Spdl., S.P.D., 1"

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500# B & S Board Drop Hammer.
800# B & S Board Drop Hammer.
18"x12' Hendey Grd. Hd., T.A.
42"x20' N.H. Geared Head Lathe, M.D.
5' American Radial, Semi-Universal, B.D.
39"x36"x12' Cin. Planer, 2 Heads.
26" S. & M. B.G. Shaper B.D.
#59½ Toledo Press 12" Stroke.
#14 Cochrane-Bly Vert. Miller & Shaper, M.D.
Bolt Cutters 1"x1½"-2"-3"-4" Acme.

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

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received by March 23rd appear in the April 2nd issue, subject to space limitations.

Address copy to the Departmental Staff
American Machinist
330 West 42nd St., New York City

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HUNDREDS of miscellaneous business problems that confront you from time to time, can be quickly and easily solved through the use of the Searchlight Section of this or other McGraw-Hill publications.

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330 West 42nd Street, New York City

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Reg. U.S. Patent Office

DRILLS
1 2 4 spdl. Henry & Wright
1 spdl. Leland-Gifford
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4 spdl. Sigourney
4 spdl. Woodward & Rogers
No. 5—4 spdl. Moline Hole Hog
No. 17—2 spdl. Foote-Burt Rail
No. 1 Baush Multiple

GEAR CUTTERS
No. 2—6" Bilton
No. ½ Pfauter Hobber
No. 4—36" Brown & Sharpe
No. 4—48" Brown & Sharpe
No. 5—48" Brown & Sharpe
96" Newton Spur Gear

GRINDERS
Hill-Clarke Production Universal
12x36 12x50 12x72
(See page 236 special advertisement Hill-Clarke Cylindrical Grinders)
No. 40 Bryant Plain, Wide Wheel, Oscillating
No. 2½ Universal (Bath Type)
No. 5 Springfield Planer Type Surface

LATHES
3½"x108" Fitchburg Lo-Swing
No. 4 AC Leblond Auto. Duplex Crankshaft
14"x6' Leblond
16"x6' Hendey
16"x8' Hendey, Taper Att., Collets
18"x6' Bradford Geared Head
20"—40"x10' Rahn-Larmon Geared Head Sliding Bed Gap
26"x10' Bridgeford
30"x12' Whitcomb-Blaisdell

PLANERS
24"x24"x6' Powell
24"x24"x12' Gray
30"x30"x8' Powell
36"x36"x8' Cincinnati
36"x36"x12' American, 2 Heads
36"x36"x18' Cincinnati
48"x48"x10' Niles-Bement-Pond

PRESSES
No. 303 Bliss Straight Sided
No. 42½ Pels Beam Shear

TURRET LATHES
2¼"x26" Greenlee, A.C. & B.F.
2¼"x26" Greenlee, Chucking
24" Steinle, 6¼" H.S.

MISCELLANEOUS
60" Quickwork Rotary Shear
No. 3-B J. N. Lapointe Broach
No. 4 J. N. La Pointe Broach
6½" Avey Metal Band Saw
6" Saunders Pipe Machine
No. 12 Bignall & Keeler Pipe Machine
No. 4 Gateman Tapper
No. 1 Garvin Tapper

HILL-CLARKE MACHINERY CO.
651 W. WASHINGTON BLVD. CHICAGO

...IN STOCK

AUTOMATICS
2" Model A Cleveland, single spindle
2½" Model A Cleveland, single spindle
2¼—3¼ Model A Cleveland, single spindle
1¼ Model F Gridley, four spindle

BROACHES
No. 3 LaPointe
Hercules 15 ton vertical

DRILLS
No. 25 Foote Burt
24" Kern
24" Cincinnati
3 Spindle Henry & Wright
4 Spindle Rockford
No. 12 Natco Multiple Spindle
No. 13 Natco Multiple Spindle
Three Way Natco Horizontal Multiple Spindle

GEAR CUTTERS
No. 10 Lees-Bradner Gear Grinder
15" Gleason Spiral Bevel Generator
18" Gleason Gear Tester
No. 2 Pfauter

GRINDERS
No. 55 Heald Internal
No. 60 Heald Internal
22"x84" Pratt & Whitney Surface
6x32 Norton Cylindrical
10x30 Landis Cylindrical
10x72 Norton Cylindrical
18"x96" Brown & Sharpe Cylindrical
16"x50" Norton Crankshaft
20A Bellvue Drill
No. 25 Heald Surface, 16" Chuck
No. 2 Brown & Sharpe Surface
No. 2 Cincinnati Tool and Cutter

LATHES
13"x6' Willard, c.d., s.q.c.
14"x6' Reed Prentice, g.h.
16"x6' Lodge & Shipley, c.d.
14"x6' Monarch c.d.
18"x8' Monarch, c.d.
21"x8' LeBlond, c.d.
9" Sundstrand Manufacturing
3½"x60" Fitchburg Lo-Swing, g.h.
18"x7' Chard Production, c.d.

TURRET LATHES
No. 1B Foster
No. 3 Foster, g.h.
21 H Gisholt
Model C 26" Libbey 7½" hole
21" Steinle
No. 2A Warner & Swasey
No. 1 Warner & Swasey
2¼x24 Jones & Lamson
No. 6A Potter & Johnston Automatic

MILLS, BORING
52" Gisholt vertical. m.d., power rapid traverse

MILLS, PLAIN
No. 3 Cincinnati, c.d.
No. 2M Cincinnati, rect. o.a. motor in base
No. 14A Garvin, c.d.
No. 7 Becker, Lincoln Type
No. 4 Hendey, Lincoln Type

MILLS, VERTCAL
No. AB Becker, c.d.
No. 4B Becker, c.d.
No. 5 Becker, c.d.
No. 2M Cincinnati Motor in Base

PLANERS
26"x26"x8' Gray
30"x30"x8' Cincinnati
33"x33"x10' Cincinnati
36"x36"x12" Woodward & Powell

SAWS
No. 4 Atkins Band, m.d.
6x6 Peerless Universal Shaping

SHAPERS
16" American, c.d.
24" Smith & Mills, c.d.

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1959-69 South Meridian Street
INDIANAPOLIS, INDIANA
Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

EXCEPTIONAL TOOLS

LATHES
30"x20' LeBlond, q.c. mtrsd.
18"x16' Flather, belt drive, quick change.
18"x8' Lodge & Shipley mtzd. quick change.

GRINDERS
12"x36" Modern Univ. motor drive.
12"x36" Pratt & Whitney Surface belt drive.
20"x144" Landis Plain Cylindrical.

POWER PRESSES
#4 Federal Inclinable, 3" stroke, bed 27"x14¾", cap. 35 ton.
25 ton Henry & Wright h.s. Dieing Machine, 5¼" single roll feed.

MISCELLANEOUS
36" x 36" x 10' New Haven Planer, one head.
20" Ohio B.G. Shaper, belt drive.

THE O'BRIEN MACHINERY CO.
113 N. THIRD ST., PHILA., PA.

MISCELLANEOUS MACHINES

Rockford Dbl. End Hydraulic **Boring Machine**
24"x14' bed **Schumacher-Boye Lathe**, rebuilt
2" **Landis** Dbl. Spdl. **Bolt Cutter**
#40 **NATCO** Straight Line **Multiple Drill**
#60 **NATCO** 3-way **Multiple Drill**
4' **Hammond Radial**, m.d.
Rockford Sgl. End. **Hydraulic Boring Unit**, with 2-sta. 54" dia. table
C-13H **NATCO Hydraulic**, m.d.
Bryant Internal Grinder with c/s
#14-26" **Besley Disc Grinder**, b.d.

THE STRONG, CARLISLE & HAMMOND CO.
1392 West 3rd St., Cleveland, Ohio
2832 E. Grand Blvd., Detroit, Mich.

GEAR CUTTERS, Spur, 30", 40" & 84", M.D.
GEAR PLANERS, Bevel, 36" & 54" Gleason, M.D.
GRINDER, Gear Tooth D-12 Detroit, M.D.
GRINDER, Warm Hob 10" x 12", B.D.
GRINDER, Universal, No. 5 B & S 20"x72", B.D.
LATHE, Geared Head, 27"x11' LeBlond Hvy. Duty.
LATHE, Wheel, 72" Bement-Miles, M.D.

LANG MACHINERY COMPANY
28th Street & A.V.R.R. Pittsburgh, Pa.

FOR IMMEDIATE DELIVERY

Planer: Ridgeway: 74"x74"x32'
Universal Milling Machine: No. 2 Cincinnati
Milling Machines: Universal No. 3 Cincinnati and Plain No. 3 Cincinnati
Milling Machine: No. 2 Becker Vert.
Turret Lathes: No. 2 W. & S. (3)
Turret Lathe: No. 3 W. & S.
Turret Lathe: No. 6 W. & S.
Turret Lathe: No. 3A W. & S.
Turret Lathe: No. 4 Gibbs
Lathe: 18"x8' Monarch, Q.C. back geared
Lathe: 16"x6' Hendey, Q.C. yoke head
Lathe: 16"x10' Whitcomb Blaisdell, Q.C.
Engine Lathe: 12"x6' W. C. Young, B.G. Q.C.
Radial Drill: 4' Universal
Press: Power, Bliss No. O, Stiles, C.B.
Press: Power, Bliss No. 4 Stiles, C.B.
Shapers: 24", 20", 16", G. & E.
Shaper: 20" Steptoe
Cy. Grinders: No. 3 Modern Universal (8)
Gear Cutter: No. 6 B. & S. 60"

RECONSTRUCTION MACHINE TOOL CORP.
11 Broadway New York City
Telephone WHitehall 3-7518

"We shall need and demand DOUBLED and QUADRUPLED PRODUCTION . . ."

PRESIDENT'S ADDRESS TO THE NATION, DEC. 9, 1941.

"M-Day is here . . . from now on business is under marching orders—fighting the BATTLE OF PRODUCTION."

EQUIPMENT

THE first question before all American industry today is: "Does our production contribute directly toward winning the war?" Never, in the history of America, biggest industrial producer in the world, have production facilities been expanded so rapidly . . . never have such mountains of material of war been produced by American factories. In many instances, existing equipment is being crowded to the limit. Additions to present production capacity are being rushed, more new plants are being built . . . and production still lags far behind the stupendous demands of the President's new WAR PRODUCTION GOALS. One of the crucial needs is equipment—more equipment—and still more equipment—YESTERDAY. When important operations are held up by delayed deliveries of equipment, one sure way of speeding operations is by the installation of good USED equipment, as countless manufacturers throughout the country are doing. Used equipment dealers and other advertisers in the Searchlight Sections of McGraw-Hill publications are supplying this vital need.

★

"Swap Inventories to Relieve Shortages."—Department of Commerce Bulletin. For many months, priorities and allocations have delayed deliveries of parts, materials and equipment essential to the expansion or continued operation of all industry. Many manufacturers are attempting to operate "on short rations"; some have enough and to spare; others have unbalanced inventories—both shortages and surpluses.

War speed-up calls for the pooling of facilities through cooperation of individual producers, swapping inventories to relieve shortages that block production.

PARTS—Inventories

"Get in the SCRAP . . . every ounce counts." Scarce materials, metals, rubber, and surplus new or USED equipment must be made available for war production.—Wilbur A. Nelson, as Priorities Administrator.

The nation-wide "Salvage for Victory" drive of the Bureau of Industrial Conservation is endeavoring to salvage materials and prevent waste. Automobile graveyards are expected to yield 3,750,000 tons of scrap . . . women are asked to carry purchases—to save wear on delivery trucks . . . merchants are asked to save waste paper, metal, rags, rubber—to enable mills and factories to operate at full blast.

MATERIALS

"SEARCHLIGHT" Can Help You Do Your Part . . .

The Searchlight Section of McGraw-Hill publications offer the accepted means used by industry to even up surpluses and shortages that tie up needed capital—or slow up production. Rates are low, and "Searchlight's" wide acceptance gets ACTION—FAST ACTION. If you WANT parts, materials or equipment—used or new—or HAVE a surplus you are willing to sell, to assist some other producer, send us details. We shall be glad to send our space recommendations, cost, etc., immediately.

ABP **AMERICAN MACHINIST** ABC

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Catskill Metal Works, Catskill, N. Y.
Page Steel & Wire Div. American Chain & Cable Co., Inc., Monessen, Pa.

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Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester, Mass.

ABRASIVE PAPER & CLOTH
Carborundum Co., Niagara Falls, N. Y.

ACCUMULATORS, Hydraulic
Watson-Stillman Co., N. Y. C.

ADAPTORS
Brown & Sharpe Mfg. Co., Providence, R. I.

AIR CONDITIONING EQUIPMENT
Surface Combustion Corp., Toledo, Ohio

ALLOYS, Copper, Brass & Bronze
American Brass Co., Div. Anaconda Copper Mining Co., Waterbury, Conn.

ALLOYS, Magnesium
American Magnesium Corp., Pittsburgh

ARBORS and MANDRELS
Brown & Sharpe Mfg. Co., Providence, R. I.
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Cushman Chuck Co., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Corp., Milwaukee, Wis.
Sundstrand Machine Tool Co., Rockford, Ill.
Union Twist Drill Co., Athol, Mass.

BABBITT
Bunting Brass & Bronze Co., Toledo, Ohio
Johnson Bronze Co., New Castle, Pa.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

BALANCING MACHINES
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Snyder Tool & Engineering Co., Detroit, Mich.

BALANCING WAYS
Sundstrand Machine Tool Co., Rockford, Ill.

BARS, Phosphor Bronze
Bunting Brass & Bronze Co., Toledo, Ohio
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Babbitt
Bunting Brass & Bronze Co., Toledo, Ohio
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Ball
Bantam Bearings Corp., South Bend, Ind.
Bearings Co., of America, Lancaster, Pa.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Torrington Co., Torrington, Conn.

BEARINGS, Bronze
Bunting Brass & Bronze Co., Toledo, Ohio
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Needle
Bantam Bearings Corp., South Bend, Ind.
Torrington Co., Torrington, Conn.

BEARINGS, Quill
Bantam Bearings Corp., South Bend, Ind.

BEARINGS, Roller
Bower Roller Bearing Co., Detroit, Mich.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Timken Roller Bearing Co., Canton, Ohio

BEARINGS, Taper
Timken Roller Bearing Co., Canton, Ohio

BEARINGS, Thrust
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Timken Roller Bearing Co., Canton, Ohio

BELT CEMENT, Dressing & Filler
Houghton & Co., E. F., Philadelphia

BELTING, Leather
Houghton & Co., E. F., Philadelphia

BENCHES and BENCH LEGS
Hill Acme Co., Cleveland
New Britain-Gridley Machine Co., New Britain, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

BENDER, Hand
Oneil-Irwin Mfg. Co., Minneapolis

BENDING and STRAIGHTENING MACHINES
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Cleveland Punch & Shear Works, Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
Niagara Machine & Tool Works, Buffalo, N. Y.
Watson-Stillman Co., N. Y. C.

BITS, Tool Holder
Armstrong Bros. Tool Co., Chicago
Firth-Sterling Steel Co., McKeesport, Pa.
McKenna Metals Co., Latrobe, Pa.
Williams & Co., J. H., Buffalo, N. Y.

BLADES, Hack & Band Saw
Capewell Mfg. Co., Hartford, Conn.
Thompson & Son Co., Henry G., New Haven, Conn.

BLOWERS
General Electric Co., Schenectady, N. Y.

BLOWERS & FANS
Allis Chalmers Mfg. Co., Milwaukee
Buffalo Forge Co., Buffalo, N. Y.

BLUING, Layout
Dykem Co., The, St. Louis, Mo.

BOLT and NUT MACHINERY
Foote-Burt Co., Cleveland
Haskins Co., R. G., Chicago
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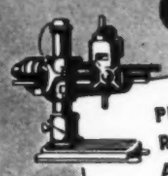

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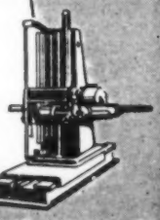

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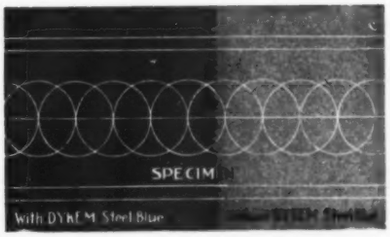

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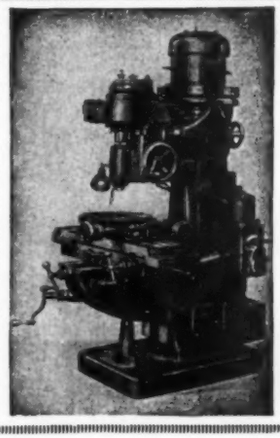

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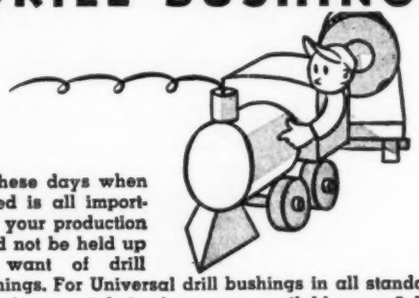

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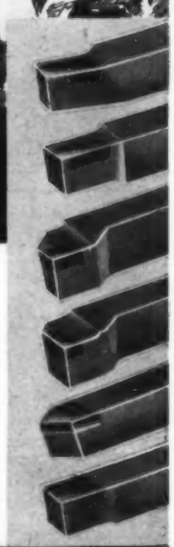

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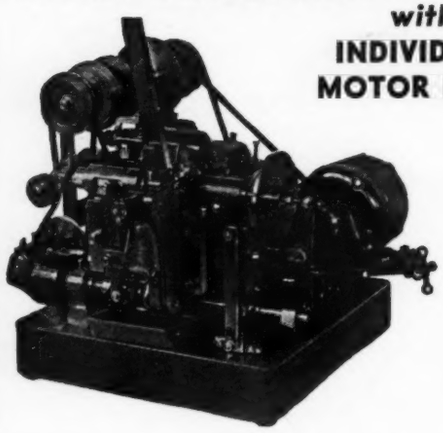

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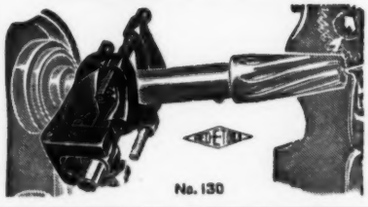

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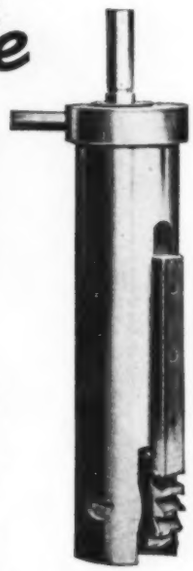

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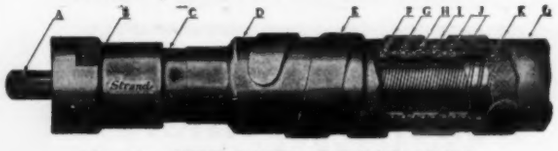

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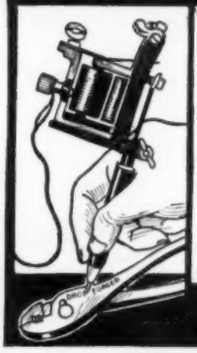

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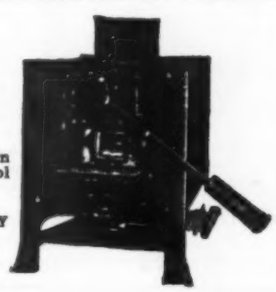

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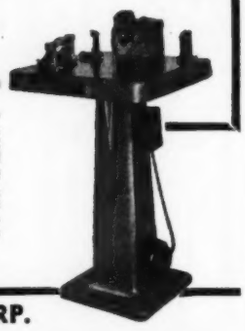

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Mattison Machine Works, Rockford, Ill.

GRINDING MACHINES, Centerless
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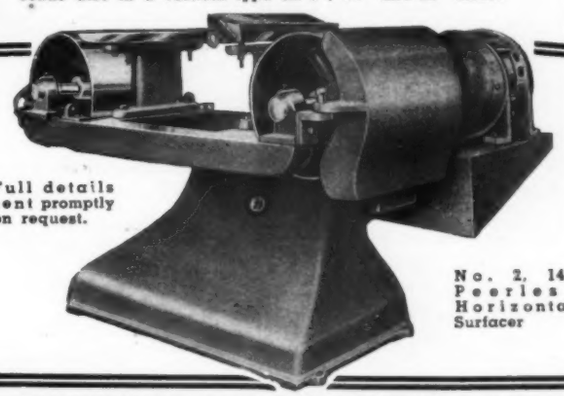

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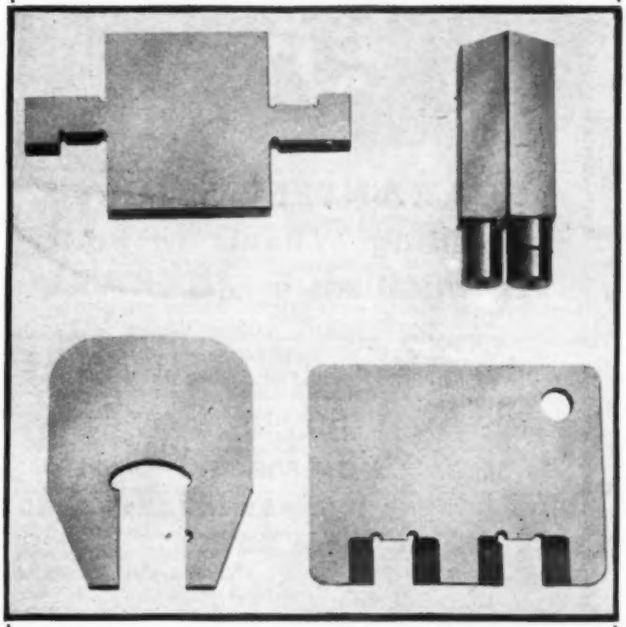

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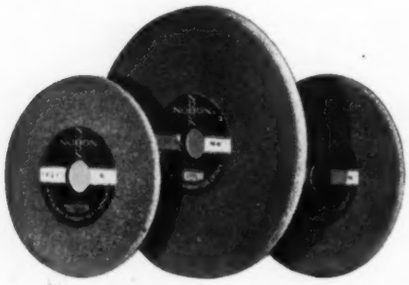

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Brown & Sharpe Mfg. Co., Providence R. I.

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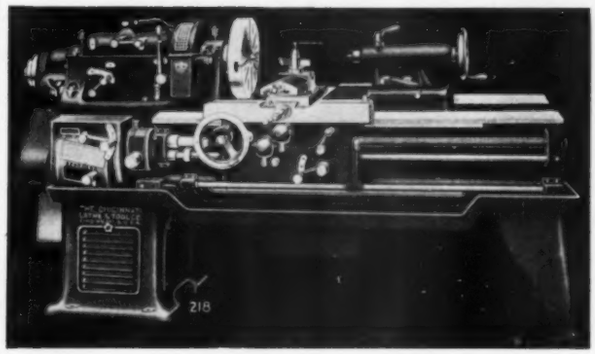

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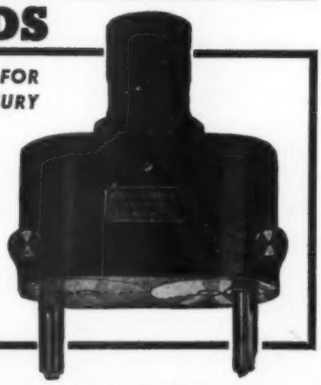

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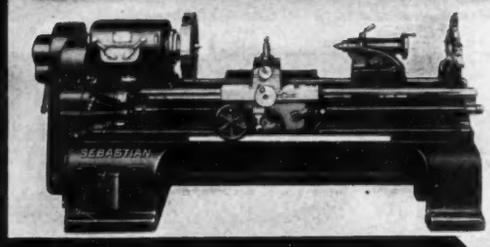

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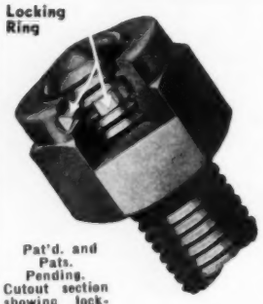

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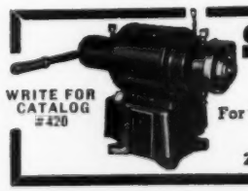

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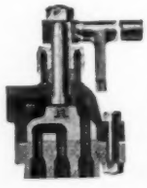

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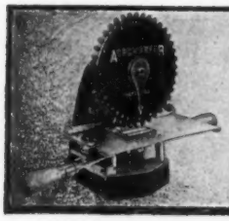

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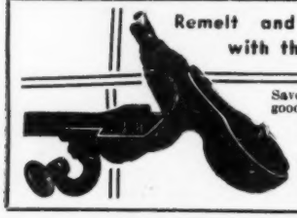

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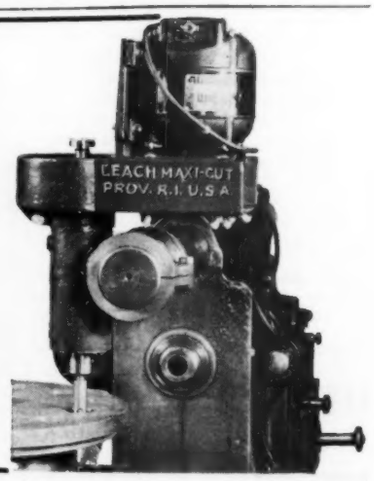

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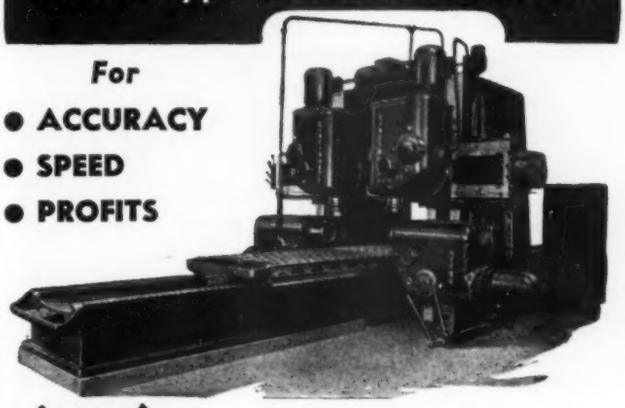

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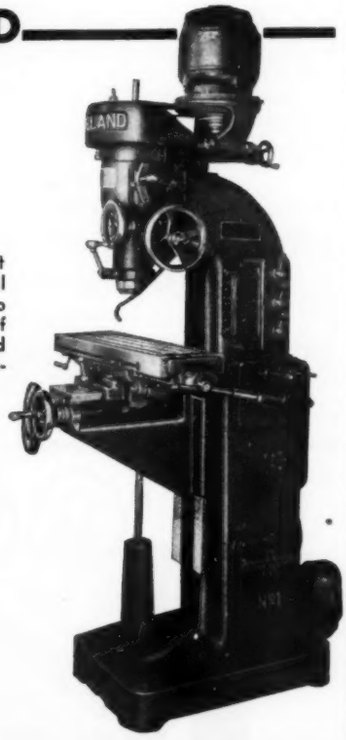

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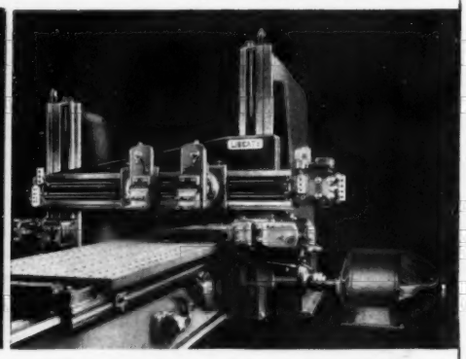

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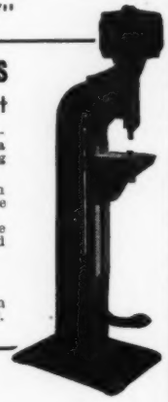

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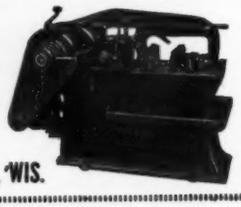

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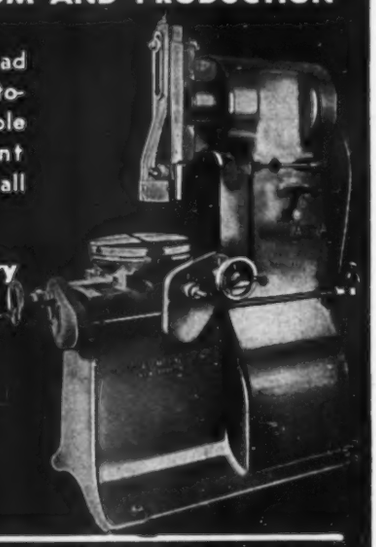
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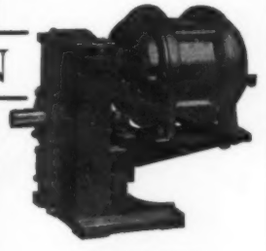
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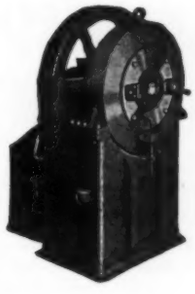
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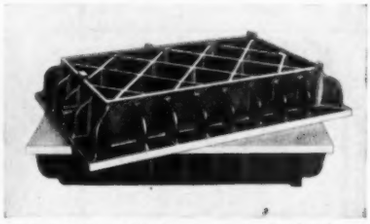

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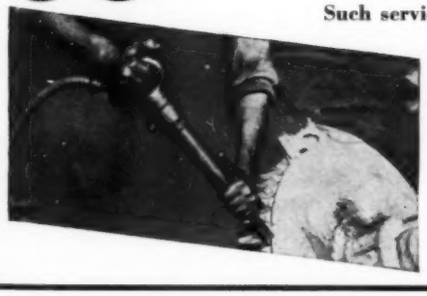

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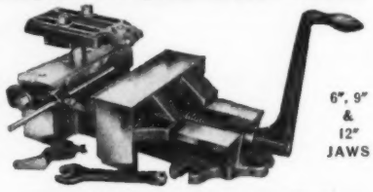

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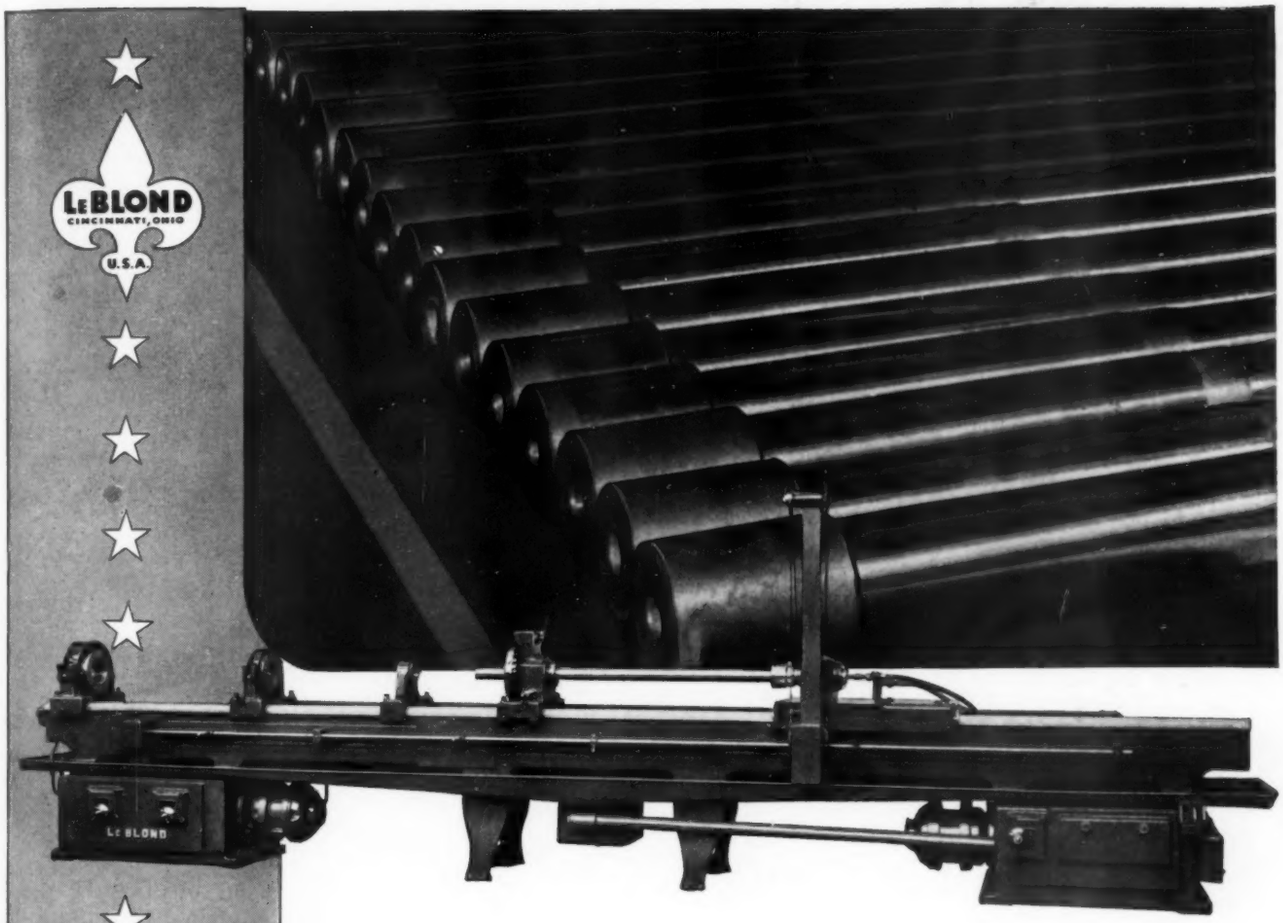

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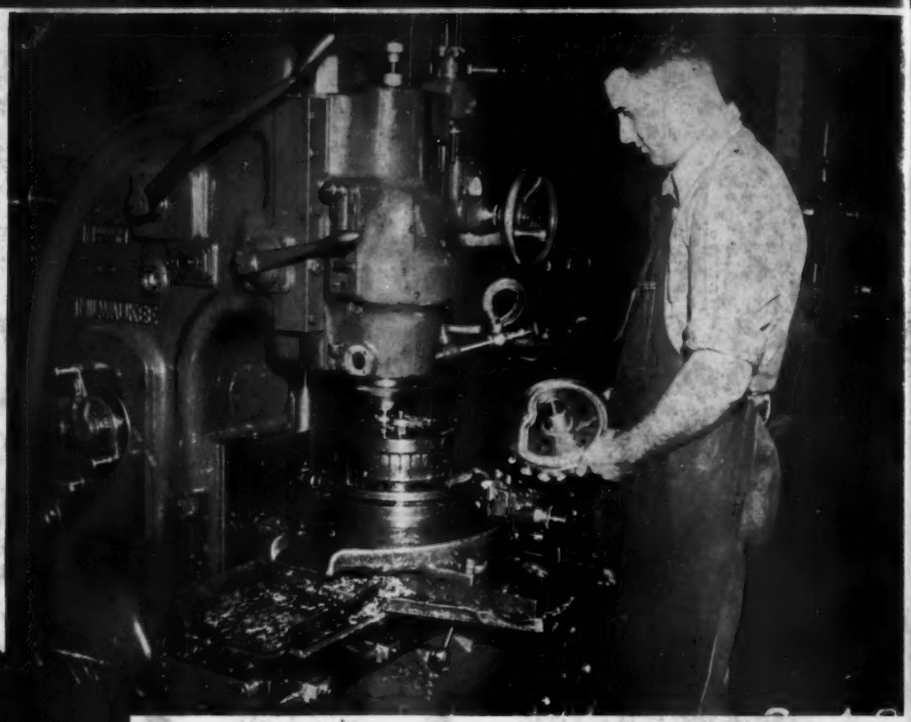
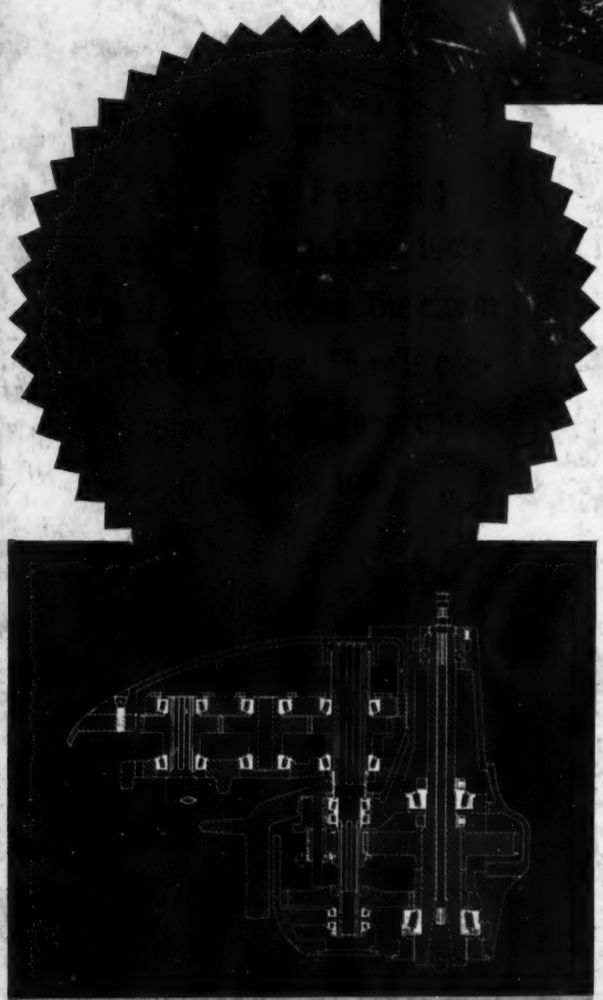


Performing a cam milling operation on a Kearney & Trecker Vertical Type Milling Machine equipped with Timken Bearings.



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